The Department of Defense

DoD DEPARTMENTS/AGENCIES:

Department of the Army

Department of the Navy

Department of the Air Force

DARPA Defense Advanced Research Projects Agency

Defense Nuclear Agency

Strategic Defense Initiative Organization

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

VOLUME III AIR FORCE ABSTRACTS OF PHASE I AWARDS 1988

VOLUME III

AIR FORCE PROJECTS

ABSTRACTS OF PHASE I AWARDS

FROM

FY 1988 SBIR SOLICITATION

May 1989

PREFACE

On September 1, 1988 Secretary of Defense Frank C. Carlucci announced the selection of small business firms proposals under Phase I of the Fiscal Year (FY) 1988 Department of Defense (DoD) Small Business Innovation Research (SBIR) Program to be funded upon successful completion of contract negotiations.

The selection of proposals for funding was made from proposals received by the Military Departments, the Defense Advanced Research Projects Agency (DARPA), the Defense Nuclear Agency (DNA), and the Strategic Defense Initiative Organization (SDIO) in response to the FY 1988 solicitation distributed on October 1, 1987 with a closing date of January 8, 1988.

FY 1988 Program

	Number of Topics	Proposals Received	Phase I Awards
Army	234	2426	214
Navy	250	2022	249
Air Force	242	2740	375
DARPA	38	555	61
DNA	8	187	19
SDIO	15	730	138
	787	8660	1056

In order to make information available on the technical content of the Phase I projects supported by the Department of Defense SBIR Program, this report presents, in four volumes, the abstracts of those proposals which have resulted in contract awards.

This is Volume III which contains abstracts and contacts for the 375 Phase I projects funded by the Air Force from the FY 1988 SBIR solicitation. Projects funded by other Department of Defense components are published in separate volumes as follows:

- Volume I - Army Projects (Pages 1 - 130)
- Volume II - Navy Projects (Pages 131 - 289)
- Volume IV - DARPA, DNA and SDIO Projects (Pages 526 - 679)

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the SBIR firm whose name and address is shown.

INTRODUCTION

On July 22, 1982 the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219). This law became effective October 1, 1982 and was designed to give small high technology firms a greater share of Federal R&D contract awards.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses, typically of one-half to one man-year effort over a period generally not to exceed six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. All DoD topics address specific R&D needs to improve our defense posture. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. The successful completion of Phase I is a pre-requisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. In addition, proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period generally not to exceed 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and availability of funds. Phase II is the principal research or research and development effort, and will require a more comprehensive proposal which outlines the intended effort in detail.

Phase III is expected to involve private-sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

Selection Criteria

Phase I proposals received in each topic area in the DoD solicitation brochure are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area and in accordance with the following criteria:

1. The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.

2. Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available or obtainable instrumentation and facilities.

3. Anticipated benefits of the research to the total DoD research and development effort.

4. Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

The Act mandates that all Federal Agencies establish an SBIR program if their FY 1982 extramural budgets for R&D exceeded a threshold figure of $100 million. Beginning in FY 1983, DoD must make available the following percentages of its extramural R&D budget for this program:

	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988
Percentage	0.1	0.3	0.5	1.0	1.25	1.25
Estimated Dollars	16.7M	43M	79M	150M	202M	221M
Actual Awarded Dollars	20.6M	44.6M	78.2M	150.7M	202M	221M

FY 1983 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	182	1121	98	43
Navy	131	944	66	47
Air Force	75	496	99	49
DARPA	8	128	12	7
DNA	10	88	8	2
	406	2777	283	148

1984 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	111	758	81	35
Navy	146	859	99	52
Air Force	283	1208	162	73
DARPA	17	107	15	7
DNA	8	80	12	1
	565	3012	369	168

FY 1985 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	111	808	124	68
Navy	138	851	110	62
Air Force	218	1306	249	120
DARPA	17	130	13	6
DNA	7	95	18	6
SDIO	18	415	36	16
	509	3605	550	278

FY 1986 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	225	1643	244	92
Navy	190	1222	225	87
Air Force	304	1795	307	138
DARPA	22	177	42	11
DNA	7	171	46	10
SDIO	12	552	154	53
	760	5560	1018	391

FY 1987 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	330	2402	331	119
Navy	263	2004	286	74
Air Force	241	1863	351	64
DARPA	33	395	59	11
DNA	8	200	25	3
SDIO	14	672	212	39
	889	7536	1264	310

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law re-authorized P.L. 97-219 to extend the "Sunset Clause" to 1993; to continue 1.25 percent taxation of the extramural research and development budget; and excludes from taxation those amounts of the DoD research and development budget obligated solely for operational systems development.

SUBMITTED BY

3C SYSTEMS INC
620 ARGYLE RD
WYNNEWOOD, PA 19096
CONTRACT NUMBER:
DANIEL W FINGER
TITLE:
RETENTION METHODS FOR PLASTIC ROTATING BANDS
TOPIC# 12 OFFICE: AD/PMR IDENT#: 23375

THE PROBLEM IS TO DEVELOP SHALLOW DEPTH ROTATING BANDS FOR HIGH VELOCITY PROJECTILES THAT WILL MINIMIZE BARREL EROSION AND REDUCE DRAG TO AN ABSOLUTE MINIMUM, USING INEXPENSIVE METHODS OF RETAINING INJECTION-MOLDABLE THERMOPLASTIC MATERIALS. THE PROPOSED APPROACH IS TO TRADE OFF STRONGLY-RETAINED LOW DRAG ROTATING BANDS AGAINST BARREL EXIT-SEPARATING BANDS THAT ARE ASSISTED IN RETENTION INSIDE THE GUN TUBE BY PROPELLANT PRESSURES. BAND MATERIALS, COUPLING AGENTS AND ADHESIVES WILL BE STUDIED FOR APPLICATION TO BOTH KINDS OF ROTATING BAND SYSTEMS. THE SYSTEMS PROMISING BEST PERFORMANCE, PRODUCIBILITY AND LOW COST WILL BE TESTED ON GUN-FIRED PROJECTILES IN PHASE 2.

AB-TECH
1615 POES LN
CHARLOTTESVILLE, VA 22901
CONTRACT NUMBER:
GERARD J MONTGOMERY
TITLE:
LEARNING SYSTEMS FOR ELECTRONIC COMBAT APPLICATIONS (LSECA)
TOPIC# 83 OFFICE: AFWAL/ASD IDENT#: 26904

ADVANCES IN ELECTRONIC COMBAT APPLICATIONS WILL SIGNIFICANTLY INCREASE THE ABILITY OF PILOTS TO OUTPERFORM A LARGE NUMBER OF ADVERSARIES IN ENVIRONMENTS WHERE THERE IS AN EXTREME INFORMATION PROCESSING BURDEN. THE NUMBER OF FACTORS PILOTS MUST CONSIDER IN MAKING ELECTRONIC COMBAT RELATED DECISIONS IS VERY HIGH AND OFTEN INVOLVE UNKNOWN RELATIONSHIPS THAT MUST BE LEARNED FROM EXPERIENCE. IN ADDITION, MUCH OF THE DATA IS UNRELIABLE OR MISSING, RESULTING IN A SUBSTANTIAL AMOUNT OF UNCERTAINTY. THIS PROPOSAL DISCUSSES A NEW

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FORM OF REASONING CALLED ABDUCTIVE REASONING AND RELATED INDUCTIVE LEARNING ALGORITHMS THAT PROVIDE A GENERAL MEANS TO ATTAIN SATISFACTORY SOLUTIONS TO PROBLEMS THAT CAN NOT BE RESOLVED USING CURRENT COMPUTER SCIENCE METHODS. THE LEARNING ALGORITHMS ARE BASED ON POLYNOMIAL NETWORK MODELING TECHNIQUES WHICH OFFER TREMENDOUS NEAR-TERM POTENTIAL IN AUTOMATICALLY SYNTHESIZING EFFECTIVE DECISION MODELS TO DEAL WITH THE UNCERTAINTIES ASSOCIATED WITH ELECTRONIC COMBAT APPLICATIONS, AND PROVIDE THE MEANS TO OBTAIN SATISFACTORY AND PRACTICAL REAL-TIME SOLUTIONS TO SUCH COMPLEX PROBLEMS.

ACCEL CATALYSIS
TECHNOLOGY INNOVATIVE CTR - UNIV OF IOWA
IOWA CITY, IA 52242
CONTRACT NUMBER:
DANIEL M LaBRUSH
TITLE:
SUPPORTED MOLTEN SALT CATALYSIS OF ENDOTHERMIC REACTION OF HIGH ENERGY-DENSITY AVIATION FUELS
TOPIC# 133 OFFICE: AFWAL/ASD IDENT#: 26977

THE PROPOSED WORK INVOLVES APPLICATION OF SUPPORTED MOLTEN SALT CATALYSIS TO THE CATALYTIC ENDOTHERMIC DEHYDROGENATION OF HIGH ENERGY-DENSITY AVIATION FUELS. THE CATALYSTS OF INTEREST ARE HETEROGENEOUSLY DISPERSED PLATINUM AND NICKEL, TO BE USED ALONE OR IN BIMETALLIC CLUSTERS. THE MOLTEN SALTS TO BE USED INCLUDE BINARY AND TERNARY EUTECTICS INVOLVING ALKALI METAL CHLORIDES AND HYDROXIDES. THE SUPPORTS TO BE EVALUATED ARE SILICA, ALUMINA, AND MONOITH OR HONEYCOMB SUPPORTS HAVING SILICA OR ALUMINA SURFACES. THE ENDOTHERMIC FUELS TO BE EXAMINED ARE METHYLCYCLOHEXAND (MCH), DECAHYDRONAPHTHALENE (DEC), AND METHANOINDANE (JP-10). THE ENDOTHERMIC DEHYDROGENATION - RETRO-DIELS-ALDER COUPLED REACTION OF JP-10 WILL BE EXAMINED FOR THE PURE FUEL AND FOR MIXTURES WITH MCH AND DEC. THE METHODOLOGY USED WILL PERMIT EVALUATION OF THE INFLUENCE OF VARIOUS SYSTEMATIC AND OPERATIONAL PARAMETERS ON CATALYTIC ACTICITY, RATES OF COMPETING SIDE REACTIONS, AND THE RATE OF CATALYST DEACTIVATION. THE OBJECTIVES WILL INVOLVE DETERMINATION OF THE CONDITIONS REQUIRED FOR OPTIMAL UTILIZATION OF THE CHEMICAL HEAT SINKS OF THE CANDIDATE FUELS.

ACCEL CATALYSIS
TECHNOLOGY INNOVATION CTR - UNIV OF IOWA
IOWA CITY, IA 52242
CONTRACT NUMBER:
DANIEL M LaBRUSH
TITLE:
SUPPORTED MOLTEN SALT DEHYDROGENTATION OF METHANOL
TOPIC# 133 OFFICE: AFWAL/ASD IDENT#: 26978

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THE PROPOSED WORK INVOLVES APPLICATION OF SUPPORTED MOLTEN SALT CATALYSIS TO THE CATALYTIC ENDOTHERMIC DEHYDROGENATION OF METHANOL. THE CATALYSTS OF INTEREST INCLUDE EUTECTICS COMPOSED OF Cu(+1) SALTS WITH HOMOGENEOUSLY DISPERSED Zn(+2) SALTS OR HETEROGENEOUSLY DISPERSED ZnO. IN ADDITION, THE STUDY WILL INCLUDE EVALUATION OF HETEROGENEOUS DISPERSIONS OF METALLIC PALLADIUM IN BINARY AND TERNARY EUTECTICS INVOLVING ALKALI METAL CHLORIDES AND HYDROXIDES. THE SUPPORTS TO BE EVALUATED ARE SILICA, ALUMINA, AND MONOLITH OR HONEY-COMB SUPPORTS HAVING SILICA OR ALUMINA SURFACES. THE METHODOLOGY USED WILL PERMIT EVALUATION OF THE INFLUENCE OF VARIOUS SYSTEMATIC AND OPERATIONAL PARAMETERS ON CATALYTIC ACTIVITY, RATES OF COMPETING SIDE REACTIONS, AND THE RATE OF CATALYST DEACTIVATION. THE OBJECTIVES WILL INVOLVE DETERMINATION OF THE CONDITIONS REQUIRED FOR OPTIMAL UTILIZATION OF THE CHEMICAL HEAT SINKS ASSOCAITED WITH METHANOL DEHYDROGENATION.

ADAPTIVE SENSORS INC
216 PICO BLVD - STE 8
SANTA MONICA, CA 90405
CONTRACT NUMBER:
LAWRENCE E BRENNAN
TITLE:
SPACE TIME ADAPTIVE PROCESSING FOR AI RADARS
TOPIC# 81 OFFICE: AFWAL/ASD IDENT#: 26901

AIRBORNE INTERCEPTOR RADARS AT UHF OR L-BAND WITH CONFORMAL WING-MOUNTED ARRAY ANTENNAS AND DIGITAL SIGNAL PROCESSING ARE OF INTEREST FOR FUTURE SYSTEMS. ADAPTIVE CONTROL OF THE ANGLE/DOPPLER RESPONSE OF THESE RADARS, USING ARRAY ELEMENT OUTPUTS, MULTIPLE BEAM OUTPUTS, OR SUB-APERTURE OUTPUTS PROVIDES A POSSIBLE METHOD OF DETECTING AND TRACKING LOW CROSS-SECTION TARGETS IN GROUND CLUTTER. THESE TECHNI-QUES ARE ALSO EFFECTIVE IN MIXED CLUTTER/JAMMING ENVIRONMENTS. THIS STUDY WILL COMPARE THE PERFORMANCE AND COMPLEXITY OF ALTERNATIVE ALGORITHMS FOR DETECTING AND TRACKING TARGETS WITH ADAPTIVE AI RADARS.

ADAPTIVE SENSORS INC
216 PICO BLVD - STE 8
SANTA MONICA, CA 90405
CONTRACT NUMBER:
LAWRENCE E BRENNAN
TITLE:
ALGORITHM FOR DETECTING SLOWLY MOVING TARGETS WITH SBR
TOPIC# 160 OFFICE: AFSD IDENT#: 27092

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SPACE BASED RADARS WITH LENS OR REFLECTOR ANTENNAS CAN READILY PROVIDE MULTIPLE BEAM OUTPUTS. OTHER SBR DESIGNED TO DETECT AND TRACK AIRCRAFT, INCLUDING SYSTEMS WITH CORPORATE FED ARRAY ANTENNAS, MAY PROVIDE MONOPULSE SUM AND DIFFERENCE OUTPUTS FOR ANGLE MEASUREMENT. A METHOD IS DESCRIBED FOR EXPLOITING THESE MULTIPLE BEAM OR MONOPULSE ANTENNA OUTPUTS FOR THE DETECTION OF SLOW-MOVING TARGETS WITH DOPPLER FREQUENCIES IN THE MAIN BEAM CLUTTER SPECTRUM. ADAPTIVE DIGITAL SIGNAL PROCESSING IS USED TO PROVIDE MOTION COMPENSATION AND REJECT THE MAIN BEAM CLUTTER RETURNS AT THE TARGET DOPPLER FREQUENCIES.

ADAPTIVE SENSORS INC
216 PICO BLVD - STE 8
SANTA MONICA, CA 90405
CONTRACT NUMBER:
JOHN S BAILEY
TITLE:
SPATIALLY DIVERSE COHERENT ARRAYS FOR SPACE BASED RADAR
TOPIC# 160 OFFICE: AFSD IDENT#: 27093

A NEW CLASS OF ARRAY CALLED THE SPATIALLY DIVERSE COHERENT ARRAY (SDCA) IS PROPOSED FOR STUDY. SUCH ARRAYS USE A NEW CONCEPT INTRODUCED HERE--THE SIMULTANEOUS TRANSMISSION OF INDEPENDENT WAVEFORM FROM DIFFERENT CONFIGURATIONS OF ELEMENTS COMPRISING THE ARRAY. WHEN COMBINED COHERENTLY ON RECEIVE VIA ADAPTIVE SPACE-TIME PROCESSING, THE (SDCA) WITH IT'S ADDITIONAL SPATIAL DEGREES OF FREEDOM (DOF) PROVIDES A SIGNIFICANT INCREASE IN THE EFFECTIVE APERTURE OVER WHAT IS AVAILABLE WITH A SINGLE TRANSMIT BEAM. SBR APPLICATION - RADARS IN ORBIT OFTEN REQUIRE MULTIPLE DOF ON RECEIVE IN ORDER TO DETECT LOW SPEED TARGETS IMBEDDED IN MAINBEAM CLUTTER. THESE DOF TYPICALLY TAKE THE FORM OF SUB-ARRAYS FOR CORPORATE FEED ANTENNAS OR OVERLAPPING RECEIVE BEAMS WITH SPACE FED LENS ARRAYS. OPTIMUM ADAPTIVE SPACE-TIME PROCESSING (A GENERALIZATION OF DPCA) STILL RESULTS IN LOSSES FOR LOW VELOCITY TARGETS RESULTING IN MINIMUM DETECTABLE TARGET VELOCITIES MDV THAT ARE INVERSELY PROPORTIONAL TO THE APERTURE SIZE. ANALYSIS INDICATES THAT THE SDCA INCREASES THE EFFECTIVENESS APERTURE BY 40% RESULTING IN A 40% REDUCTION IN THE MDV. A SDCA WITH ONLY TWO SIMULTANEOUS TRANSMIT BEAMS, EACH WITH

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A DIFFERENT CODING, AND TWO RECEIVE BEAMS, ALLOWS DE-COUPLING OF 4 ROUND TRIP PATHS. SUCH A SYSTEM HAS A LOWER MDV THAN A FULLY ADAPTIVE ARRAY WITHOUT SPATIAL DIVERSITY.

ADAPTIVE TECHNOLOGY INC
309 CURTIS ST
SYRACUSE, NY 13208
CONTRACT NUMBER:
DONALD R MIEDANER
TITLE:
MULTIDOMAIN ADAPTIVE SPACE/TIME PROCESSING AND SYSTOLIC ARRAYS
TOPIC# 81 OFFICE: AFWAL/ASD IDENT#: 26902

THE OBJECTIVES OF THE PROPOSED PHASE I PROJECT ARE AS FOLLOWS: DEVELOP NEW ADAPTIVE SPACE/TIME ARCHITECTURES, APPLICABLE TO A FORWARD DPCA (ANTENNA MOVES NORMAL TO APERTURE PLANE), WHICH DEAL WITH JAMMING, CLUTTER, NARROWBAND INTERFERENCE, ERROR EFFECTS AND PLATFORM MOTION AS A SINGLE, INTEGRATED MULTIDOMAIN ADAPTIVE SPACE/ TIME PROCESS. THUS, ADAPTIVE SPACE/TIME TECHNOLOGY IS EXTENDED TO INCLUDE NOT ONLY THE ADAPTIVE SUPPRESSION OF JAMMING AND CLUTTER BUT ALSO THE ADAPTIVE CANCELLATION OF NARROWBAND UNINTENTIONAL INTER-FERENCE, THE ADAPTIVE COMPENSATION OF ERROR EFFECTS IN THE ENVIRON-MENT, ANTENNA AND RECEIVE CHANNEL AND ADAPTION TO SEVERE PLATFORM MOTION. DEVELOP THE ARCHITECTURE FOR A SYSTOLIC ARRAY DIGITAL PRO-CESSOR WHICH CAN PROVIDE THE REQUIRED PROCESSING POWER FOR IMPLEMENT-ING MULTIDOMAIN SPACE/TIME PROCESSING. GENERATE AN EXPERIMENTAL PLAN FOR PHASE II WHICH INCLUDES A SCALE-DOWN SYSTOLIC IMPLEMENTATION OF A MULTIDOMAIN ADAPTIVE SPACE/TIME PROCESSOR, WITH RF-TO-DIGITAL CON-VERSION, AND A COMPUTER-DRIVEN WAVEFORM EMULATOR BASED ON VECTOR MODULATION TECHNIQUES. THE PHASE I PROJECT WILL GENERATE AND USE A DETAILED COMPUTER MODEL WHICH WILL INCLUDE THE ENVIRONMENT (JAMMING SOURCES, CLUTTER, NARROWBAND INTERFERENCE AND TARGET RETURNS), THE ANTENNA (INCLUDING DISPERSIVE EFFECTS USING, AS REQUIRED, DETAILED ELECTROMAGNETIC MODELS), THE RECEIVE CHANNELS (CHANNEL MISMATCH ERRORS, DYNAMIC RANGE EFFECTS, ETC.) AND THE DIGITAL PROCESSOR (IN-CLUDING A/D CONVERSION, I/Q RESOLUTION AND SYSTOLIC ARRAY PROCESSING STRUCTURES).

ADVANCED COMPOSITE PRODUCTS INC
21 COMMERCE DR
NORTH BRANFORD, CT 06471
CONTRACT NUMBER:
DOUGLAS HOON
TITLE:
LIGHTWEIGHT EASILY ERECTABLE SUSTAINING AIRCRAFT MAINTENANCE SHEL
TOPIC# 57 OFFICE: AFESC/RDXP IDENT#: 23196

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THE OBJECTIVE OF THIS EFFORT IS TO PROVIDE A REVIEW AND ANALYSIS OF EXISTING AIRCRAFT MAINTENANCE SHELTER STRUCTURES AND MATERIALS AND MOBILE HEATING/COOLING SYSTEMS. ONE ATTRACTIVE APPROACH IS TO REFINE PRIOR WORK ON THE LOCARCH SHELTER PROGRAM IN A TEAMING EFFORT WITH LOCKHEED GEORGIA COMPANY, THE ORIGINAL DEVELOPER. SHOULD NO EXISTING SHELTER HARDWARE PROVIDE SATISFACTORY PERFORMANCE, THE EFFORT SHALL ALSO INCLUDE PRELIMINARY DESIGN OF REQUIRED MODIFICATIONS TO THE BEST EXISTING DESIGN TO MEET REQUIREMENTS THROUGH THE USE OF COMPOSITE MATERIALS. EMPHASIS SHALL BE PLACED ON LIGHTWEIGHT, MOBILE SHELTERS. IT IS ANTICIPATED THAT AT THE CONCLUSION OF PHASE I, ALL PRELIMINARY DESIGNS, MANUFACTURING PLANNING, AND CONTRACTUAL ISSUES NECESSARY TO ALLOW FABRICATION AND TEST OF A FULL-SIZED PROTOTYPE STRUCTURE SHALL BE COMPLETED.

ADVANCED COMPOSITE TECHNOLOGY INC
15097 - W 44TH AVE
GOLDEN, CO 80403
CONTRACT NUMBER:
BRADFORD L WHATLEY
TITLE:
SMALL CRATER BRIDGING MATERIAL
TOPIC# 59 OFFICE: AFESC/RDXP IDENT#: 23220

THIS PROJECT WILL RESEARCH MATERIALS AND DEVELOP A DESIGN AND CONCEPT FOR MAKING A ULTRA-STRONG, LIGHT WEIGHT SMALL CRATER REPAIR SYSTEM USING ULTRA-LIGHT, ULTRA-STRONG ADVANCED MATERIALS. THE END PRODUCT FOR PHASE I WILL BE A DETAILED DESIGN AND ANALYSIS FOR THE SYSTEM. THE ADVANCED MATERIAL SYSTEM WILL BE DESIGNED TO TAKE ADVANTAGE OF A NUMBER OF SIGNIFICANT ADVANCES IN MATERIALS AND PROPRIETARY TECHNOLOGY IN MANUFACTURING DEVELOPED BY ADVANCED COMPOSITE TECHNOLOGY, INC. (ACT). ACT HAS DEVELOPED TWO TECHNOLOGIES SIGNIFICANT FOR THIS PROJECT. THE FIRST TECHNOLOGY IS TO LAY WET LAMINATE FIBERS AT COMMERCIAL SPEEDS WHILE PRODUCING A SMOOTH PRODUCT WITH LOW VOID CONTENT AT PRECISE ANGLES. THE SECOND TECHNOLOGY IS THE ABILITY TO LAY COMPLEX GEOMETRIC PARTS USING ROBOTICS. THE ABILITY TO MANUFACTURE AT COMMERCIAL SPEEDS USING NON PRE-PREG MATERIALS ALLOWS FOR TAILORING A MATRIX USING DIFFERENT FIBERS WITHIN THE BUNDLE AND OFFERS POTENTIALLY MAJOR REDUCTIONS IN COSTS.

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ADVANCED DECISION SYSTEMS
201 SAN ANTONIO CIR - STE 286
MOUNTAIN VIEW, CA 94040
CONTRACT NUMBER:
LAURA DeYOUNG-BIALON
TITLE:
USER-FRIENDLY INTERFACE FOR ATTACHING DYNAMIC ATTRIBUTES TO GRAPHIC OBJECTS
TOPIC# 105 OFFICE: AFWAL/ASD IDENT#: 26934

A DYNAMIC ATTRIBUTE SPECIFICATION AND ATTACHMENT KIT (DASAK) IS PROPOSED TO SERVE AS A SUPPORT COMPONENT FOR THE RAPIDLY RECONFIGURABLE CREWSTATION (RRC) PROGRAM. A DASAK WILL PROVIDE A USER-FRIENDLY INTERFACE TO COCKPIT DESIGNERS WITHOUT PROGRAMMING EXPERIENCE FOR DEFINING DYNAMIC ATTRIBUTES AND ATTACHING THEM TO GRAPHIC OBJECTS, SUCH AS TARGET AIRCRAFT, WEAPONS, ETC., WHICH ARE FOUND IN COCKPIT DISPLAYS. BESIDES PROVIDING AN EFFECTIVE INTERFACE AND THE UNDERLYING SUPPORT FOR CREATING THE DYNAMIC ATTRIBUTE DEFINITIONS AND ATTACHING THEM TO THE OBJECTS, A DASAK WILL INCLUDE THE FOLLOWING: A DYNAMIC ATTRIBUTE MANAGER TO INSURE THE PROPER BEHAVIOR AND PROPAGATION OF ATTRIBUTES; A MANUAL SIMULATION FACILITY FOR EASY TESTING OF INDIVIDUAL OBJECTS AND ATTRIBUTES; CONSISTENCY CHECKING AMONG DYNAMIC ATTRIBUTES; DYNAMIC ATTRIBUTE DATABASE MANAGEMENT, EDITING, AND BROWSING; AN AUDIT-TRIAL FACILITY; AN ON-LINE HELP FACILITY; AND APPROPRIATE INTERFACE FACILITIES TO OTHER COMPONENTS OF THE RRC. THE RESEARCH PROPOSED HERE INCLUDES A THOROUGH STUDY OF USER-INTERFACE METHODOLOGY AND TECHNOLOGIES WHICH MAY PROVE APPROPRIATE FOR A DASAK, A THOROUGH STUDY OF RRC REQUIREMENTS, DESCRIPTION AND CHARACTERIZATION OF DYNAMIC ATTRIBUTES, IDENTIFICATION OF THREE USER-INTERFACE CONCEPTS FOR A DASAK, AND GENERATION OF DESIGNS FOR THREE WORKING REPRESENTATIONS OF THESE CONCEPTS.

ADVANCED DECISION SYSTEMS
201 SAN ANTONIO CIR - STE 286
MOUNTAIN VIEW, CA 94040
CONTRACT NUMBER:
CINDY A O'REILLY
TITLE:
KNOWLEDGE BASED DECISION ANALYTIC STRUCTURE FOR DECISION AIDING
TOPIC# 37 OFFICE: RADC/XPX IDENT#: 28562

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AND THUS ENABLE THE USERS TO GAIN CONFIDENCE IN THE SYSTEM AS THEY USE IT. THIS RESEARCH WILL EXPLORE THESE AND OTHER TECHNIQUES FOR VERIFYING AND VALIDATING AI SOFTWARE IN THE CONTEXT OF AN OVERALL SOFTWARE DEVELOPMENT MODEL THAT IS COMPATIBLE WITH AI SOFTWARE DEVELOPMENT METHODS. MULTIPLE V&V TECHNIQUES ARE NEEDED, AND THE CHOICE OF THE SET OF V&V TECHNIQUES USED FOR ANY SOFTWARE APPLICATION DEPENDS ON THE APPLICATION, ON THE AI FEATURES USED IN THE SOFTWARE, AND ON THE SOFTWARE DEVELOPMENT ENVIRONMENT. A GOAL OF THIS RESEARCH IS TO DEVELOP GUIDELINES FOR CHOOSING THE V&V TECHNIQUES THAT ARE EFFECTIVE FOR A GIVEN APPLICATION.

ADVANCED FUEL RESEARCH INC
PO BOX 18343 - 87 CHURCH ST
EAST HARTFORD, CT 06118
CONTRACT NUMBER:
MICHAEL A SERIO
TITLE:
THERMAL STABILITY OF AVIATION FUELS
TOPIC# 131 OFFICE: AFWAL/ASD IDENT#: 26974

THE EFFICIENT DEVELOPMENT OF ADVANCED AIRCRAFT CONCEPTS OR INTRODUCTION OF NEW FUELS WILL REQUIRE INCREASED MECHANISTIC UNDERSTANDING AND MODELS TO PREDICT THERMAL STABILITY IN ORDER TO ELIMINATE THE REQUIREMENT FOR EXTENSIVE EMPIRICAL TESTING. THE PROPOSAL IS FOR A COMBINED EXPERIMENTAL, ANALYTICAL, AND MODELING PROGRAM TO DEVELOP A MECHANISTIC UNDERSTANDING AND MODEL OF FUEL THERMAL STABILITY. THE PRIMARY OBJECTIVE OF THE PROGRAM CARRIED THROUGH PHASE II IS THE ABILITY TO PREDICT, GIVEN THE COMPOSITION OF THE FUEL AND THE CONDITIONS IN THE FUEL LINES AND ENGINE, THE DECOMPOSITION OF THE LIQUID, THE FORMATION OF GUMS IN THE LIQUID AND THE DEPOSITION OF SURFACES. IN ADDITION, WE EXPECT THAT AN ON-BOARD FUEL STABILITY MONITOR CAN BE DEVELOPED BASED ON A PORTABLE FT-IR INSTRUMENT AND A SPECIALLY CONSTRUCTED CELL. THE PROGRAM WOULD UTILIZE SPECIALIZED ANALYTICAL TECHNIQUES FOR HYDROCARBON FUELS THAT HAVE BEEN DEVELOPED AT ADVANCED FUEL RESEARCH, (AFR), INC. AND SRI INTERNATIONAL (A SUBCONTRACTOR). IT WOULD ALSO EMPLOY SEVERAL MODELING TECHNIQUES FOR HYDROCARBON THERMAL DEGRADATION, WHICH HAVE BEEN DEVELOPED AT AFR. THE OBJECTIVE OF THE PHASE I PROGRAM IS TO DEMONSTRATE THE VALUE OF THESE SPECIALIZED ANALYTICAL AND MODELING

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TECHNIQUES DEVELOPED AT AFR AND SRI FOR FOLLOWING THE PROGRESS OF FUEL THERMAL DEGRADATION. IN PHASE II, A WIDER RANGE OF FUELS AND CONDITIONS WOULD BE INVESTIGATED AND THE DETAILED MODEL DEVELOPMENT AND VALIDATION WOULD OCCUR. THE PHASE II EFFORT WOULD ALSO INCLUDE FURTHER DEVELOPMENT OF THE ON-BOARD FT-IR DIAGNOSTIC INSTRUMENT.

ADVANCED FUEL RESEARCH INC
87 CHURCH ST
EAST HARTFORD, CT 06108
CONTRACT NUMBER:
DAVID G HAMBLEN
TITLE:
INFRARED DETECTORS USING BULK HIGH T(c) GRANULAR JOSEPHSON JUNCTIONS
TOPIC# 163 OFFICE: AFSD IDENT#: 27099

THE RECENT DISCOVERY OF PEROVSKITE-LIKE COPPER-OXIDE SUPERCONDUCTORS WITH TRANSITION TEMPERATURES ABOVE LIQUID NITROGEN TEMPERATURES HAS LED TO RENEWED INTEREST IN THE APPLICATION OF SUPERCONDUCTIVITY. THESE NEW YBaCuO (YBa[2]Cu[3]O[7-x]) MATERIALS OFFER THE OPPORTUNITY TO USE THESE MATERIALS AS DETECTORS MORE CONVENIENTLY THAN THE "CLASSICAL" SUPERCONDUCTORS. THE LARGER ENERGY GAP OF THESE NEW HIGH T(c) MATERIALS ALSO PROVIDE THE OPPORTUNITY TO FABRICATE JOSEPHSON JUNCTION DETECTORS CAPABLE OF SENSING OPTICAL RADIATION AND MUCH LOWER WAVELENGTHS, OFFERING NEW COMPETITION TO PREVIOUS SEMICONDUCTOR IR DECTORS IN THE 10 TO 100 MICROMETER REGION. THE OBJECTIVE OF THE PHASE I AND PHASE II PROPOSAL IS TO DEVELOP IR SENSOR BASED ON GRINY JOSEPHSON JUNCTIONS IN YBaCuO-TYPE SUPERCONDUCTORS. THE APPROACH OFFERED IN PHASE I IS TO USE BULK YBaCuO MATERIALS TO DEMONSTRATE THE FEASIBILITY OF USING THESE GRAINY MATERIALS AS IR DETECTORS. PHASE II WOULD CONCENTRATE ON OPTIMIZING THE PERFORMANCE AND TESTING THESE DEVICES BASED ON THE RESULT OF PHASE I. THEY ARE, IN PRINCIPLE, READILY FABRICATED (BY VIRTUE OF THEIR NATURAL GRAININESS) AND ARE VIEWED TO BE A MOST ATTRACTIVE CHOICE FOR DEVELOPMENT USING THE NEW HIGH T(c) MATERIALS.

ADVANCED FUEL RESEARCH INC
PO BOX 18343 - 87 CHURCH ST
EAST HARTFORD, CT 06118
CONTRACT NUMBER:
PETER R SOLOMON
TITLE:
DEVELOPMENT OF A BENCH TOP INSTRUMENT FOR MEASURING HIGH TEMPERATURE SURFACE EMISSIVITY
TOPIC# 22 OFFICE: AEDC/DOT IDENT#: 28585

SUBMITTED BY

FOR SURFACES AT HIGH TEMPERATURE THE EMITTED SPECTRUM OF ELECTRO-MAGNETIC RADIATION IS THE MOST CONVENIENT PROBE OF TEMPERATURE, IF THE SPECTRAL EMITTANCE OF THE SAMPLE IS KNOWN. THIS PROPOSAL SUG-GESTS THE APPLICATION OF FOURIER TRANSFORM (FT) SPECTROSCOPY TO THE MEASUREMENT OF SPECTRAL EMITTANCE. THE OBJECTIVE OF PHASE I IS TO DEMONSTRATE THE DETERMINATION OF SPECTRAL EMITTANCE EMPLOYING A FI-IR SPECTROMETER COUPLED TO A MODERATE TEMPERATURE FURNACE. MEASUREMENTS WOULD BE MADE OF THE RADIANCE FROM SAMPLES IN A THIN WALL FURNACE AND OF THE INTEGRATED SPECULAR AND DIFFUSE REFLECTION IN A MORE CON-VENTIOAL FURNACE. THE RESULTS OF THE TWO METHODS WILL BE COMPARED AND THE ERRORS CONSIDERED. MEASUREMENTS WOULD BE MADE AT TEMPE-RATURES UP TO 2000 DEG R BETWEEN 1.7 AND 20 MICRONS AND NEARLY NORMAL INCIDENCE. IN PHASE II, AN INSTRUMENT WILL BE CONSTRUCTED BASED ON THE RESULTS OF THE TWO METHODS. AMONG THE CONCEPTS TO BE CONSIDERED FOR THE FINAL DESIGN ARE THE USE OF BOTH REFLECTION AND EMISSION MEASUREMENTS. THE REFLECTION METHOD WOULD DETERMINE THE SPECTRAL EMITTANCE ON A HOT SAMPLE WHOSE TEMPERATURE, AT THE MEASUREMENT POINT, MAY BE IMPRECISELY KNOWN. THE EMISSION MEASUREMENT, MADE SIMULTANEOUSLY WOULD DETERMINE THE TEMPERATURE, BASED ON THE MEASURED SPECTRAL EMITTANCE. THE PHASE II PROGRAM WOULD RESULT IN AN INTEGRATED, AUTOMATED, BENCH TOP, RESEARCH PROTOTYPE INSTRUMENT FOR EVALUATION.

ADVANCED MATERIAL SYSTEMS INC
1246 ST SCHOLASTICA DR
SLIDELL, LA 70460
CONTRACT NUMBER:
MATTHEW LIU
TITLE:
ORGANIX MATRIX COMPOSITE MATERIALS FOR CRYOGENIC SERVICE
TOPIC# 174 OFFICE: AFAL IDENT#: 27120

APPLICATION OF ADVANCED ORGANIC COMPOSITE AT CRYOGENIC TEMPERATURE IS OF CURRENT INTEREST. HOWEVER, RELATIVELY LIMITED DEVELOPMENT WORK HAS BEEN DONE IN THIS AREA. OUR UNDERSTANDING OF THE MECHANICAL AND CHEMICAL BEHAVIOR OF AN ORGANIC COMPOSITE MATERIAL AT CRYOGENIC ENVIRONMENT IS SOMEWHAT LACKING. IN ORDER TO UNDERSTAND THE FUNDA-MENTAL MECHANISMS THAT AFFECT THE PERFORMANCE OF AN ORGANIC COMPOSITE

SUBMITTED BY

MATERIAL AT CRYOGENIC TEMPERATURES, THIS PROPOSAL DISCUSSES NOVEL APPROACHES TAKEN IN SELECTING RESIN MATRIX AND TEST PROGRAM FOR THE STUDY. THE PROPOSAL DESCRIBES THE USE OF AMORPHOUS COPOLYMERS AND POLYMER ALLOYS AS RESIN MATRIX FOR FABRICATION OF COMPOSITES. THIS PROPOSAL DEVELOPS A TEST MATRIX. WE WILL ASSESS FAILURE MOOD ANALYSIS, EFFECT OF GLASS-TRANSITION TEMPERATURE (Tg), MOLECULAR WEIGHT/DISTRIBUTION, MOLECULAR STRUCTURE, FUNCTIONAL GROUP AND POLYMERIZATION KINETICS ON THE COMPOSITE PROPERTIES INCLUDING INTER-FACIAL BONDING STRENGTH, INTERLAMINAR SHEAR STRENGTH, TENSILE STRENGTH, IMPACT STRENGTH, FRACTURE TOUGHNESS AND MOISTURE SENSITIVITY, ETC. INFORMATION OBTAINED WILL PROVIDE NEEDED DIRECTIONS FOR FUTURE DEVELOPMENT WORK IN UP-GRADING ORGANIC MATRIX COMPOSITE FOR CRYOGENIC SERVICE.

ADVANCED MECHANICAL TECHNOLOGY INC
151 CALIFORNIA ST
NEWTON, MA 02158
CONTRACT NUMBER:
FOREST J CARIGNAN
TITLE:
HIGH TEMPERATURE TRIBOMETER
TOPIC# 129 OFFICE: AFWAL/ASD IDENT#: 26972

A MACHINE TO EVALUATE THE FRICTION AND WEAR PROPERTIES OF MATERIALS AT TEMPERATURES UP TO 1000 DEG C IS PROPOSED. BOTH LUBRICATED AND UNLUBRICATED TESTING WITH LIQUIDS AND SOLIDS WILL BE POSSIBLE USING A PIN-ON-DISC GEOMETRY. COMPLETE CONTROL OVER THE TEST ATMOSPHERE AND MANUAL OR COMPUTER-CONTROL OF ALL VARIABLES WILL BE POSSIBLE DATA ACQUISITION AND STORAGE WILL BE PERFORMED BY COMPUTER. THE TRIBOMETER WILL BE A MODIFIED VERSION OF A STANDARD DEVICE SOLD BY ADVANCED MECHANICAL TECHNOLOGY, INC. CHANGES TO INCORPORATE LUBRI-CATION, WEAR MONITORING, AND COMPUTER CONTROL WOULD BE MADE FOR THIS PROGRAM.

ADVANCED RSCH & APPLICATIONS CORP/ARACOR
425 LAKESIDE DR
SUNNYVALE, CA 94086
CONTRACT NUMBER:
KARL H HOOVER
TITLE:
RAPID FIELD INSPECTION CAPABILITY FOR COMPOSITE AIRCRAFT
TOPIC# 145 OFFICE: AFWAL/ASD IDENT#: 26990

SUBMITTED BY

THE DEVELOPMENT AND ADOPTION OF HONEYCOMB STRUCTURES AND OTHER ADVANCED COMPOSITE AIRCRAFT MATERIALS REQUIRE NEW MODES OF INSPECTION, BOTH DURING PRODUCTION AND FOLLOWING DEPLOYMENT, THAT ARE FASTER, MORE DEFINITIVE, LESS COSTLY AND EASIER TO USE THAN CONVENTIONAL FILM RADIOGRAPHY. ONE PROMISING NEW TECHNIQUE IS LAMINOGRAPHY. THIS RADIOGRAPHIC IMAGE PROCESSING MODALITY ALLOWS INSPECTION OF PLANES OR SURFACES INTERIOR TO THE OBJECT OF INTEREST. CURRENTLY, LAMINOGRAPHY IS PERFORMED ON CT/DIGITAL RADIOGRAPHY INSTRUMENTS AND ACHIEVES OBJECT INSPECTION BY MEASURING A SEQUENCE OF RADIOGRAPHIC VIEWS AND POST-PROCESSING THEM INTO IMAGES OF THE PLANES OR CONTOUR SURFACES OF INTEREST. THE TECHNIQUE COULD BE MADE MORE PORTABLE, FASTER, AND LESS COSTLY BY IMPLEMENTING THIS NEW TECHNOLOGY USING REAL-TIME IMAGE PROCESSING EQUIPMENT. THE DETECTION AND VIDEO PROCESSING TECHNIQUES USED IN DIGITAL AND HYBRID FLUOROGRAPHY HOLD OUT THE PROMISE OF REAL-TIME LAMINOGRAPHIC INSPECTIONS FOR AIRCRAFT STRUCTURES WHILE SIMULTANEOUSLY ACHIEVING IMPROVED ANOMALLY DETECTION RELATIVE TO CONVENTIONAL FILM RADIOGRAPHY.

ADVANCED TECHNOLOGY MATERIALS INC
520-B DANBURY RD
NEW MILFORD, CT 06776
CONTRACT NUMBER:
DR WARD C STEVENS
TITLE:
MANUFACTURING METHOD FOR ALUMINUM COATED GLASS FIBERS
TOPIC# 205 OFFICE: BMO/MYSC IDENT#: 28618

ALUMINUM COATED GLASS FIBERS HAVE FOUND BROAD BASED USE AS RADAR CHAFF, HOWEVER, EXISTING METHODS OF MANUFACTURE ARE GENERALLY HIGH COST AND DO NOT OPTIMIZE ADHESION BETWEEN METAL AND GLASS WHICH MAY LEAD TO PERFORMANCE LOSS DURING HANDLING OR PROCESSING. BY UTILIZING A HIGH SPEED, LOW CAPITAL COST PROCESS SUCH AS CHEMICAL VAPOR DEPOSITION (CVD) IN COMBINATION WITH NOVEL INTERLAYER TECHNOLOGY, A PROCESS CAN BE ENVISIONED THAT MINIMZES COST WHILE MAXIMIZING PROPERTIES. ADDITIONALLY, THE CVD PROCESS OFFERS THE ABILITY TO EVENLY COAT A WIDE RANGE OF FIBER TOWS AND DIAMETERS WITH MINIMAL MANUFACTURING LINE CHANGES, ENABLING A RAPID RESPONSE TO FIELD NEEDS FOR MODIFIED MATERIALS. RECENTLY SUCH A PROCESS HAS BEEN DEMONSTRATED WITH NICKEL

SUBMITTED BY

COATED GLASS FIBER, THEREFORE IN PHASE I OF THIS STUDY A DEVELOPMENT EFFORT WILL BE CARRIED OUT TO ADAPT THIS PROCESS TO ALUMINUM COATED FIBER. DURING THIS PHASE THE COATING MATERIALS WILL BE IDENTIFIED, A PROTOTYPE. POSITIVE PHASE I RESULTS, INCLUDING INITIAL COST ESTIMATES, WOULD LEAD TO A PHASE II PROGRAM IN WHICH A PILOT LINE WOULD BE BUILT AND COMMERCIAL QUANTITIES OF COATED FIBER PRODUCED.

AERODYNE RESEARCH INC
45 MANNING RD
BILLERICA, MA 01821
CONTRACT NUMBER:
DR ROBERT L HUGUENIN
TITLE:
CONTROLLED EMITTANCE MATERIAL FOR IR SIGNATURE SUPPRESSION APPLICATIONS
TOPIC# 144 OFFICE: AFWAL/ASD IDENT#: 26988

SKIN COATINGS FOR IR SIGNATURE SUPPRESSION REQUIRE MORE THAN SIMPLE EMISSIVITY CONTROL. CONTROL OF THE DIRECTIONAL DISTRIBUTION OF EMITTED/REFLECTED RADIATION AND ACTIVE HEATING OR COOLING ARE ALSO NECESSARY. THE RADIANCE FROM THE OBJECT NEEDS TO APPROXIMATE THE RADIANCE FROM THE BACKGROUND OVER A BROAD RANGE OF VIEWING ANGLES. THIS REQUIRES A COMPLICATED BIDIRECTIONAL REFLECTANCE DISTRIBUTION FUNCTION (BRDF) FOR THE COOLING MATERIAL. TO ACHIEVE THIS BRDF THE APPROPRIATE SETS OF EMISSIVITY, TEMPERATURE, AND DIRECTIONAL DISTRIBUTION CONTROLS NEED TO BE SELECTED AND COMBINED. THE RESULTING SKIN RADIANCES NEED TO BE COMPUTED FOR REALISTIC DISTRIBUTIONS OF EXTERNAL RADIANT SOURCES, OBJECT SURFACE TEMPERATURES, AND VIEWING GEOMETRIES TO INSURE THAT THE DESIGN PRODUCES CONTRAST RADIANCES THAT ARE BELOW THE DETECTION THRESHOLD. BECAUSE OF THE COMPLEXITY, THE R&D PROCESS REQUIRES A ROBUST SIGNATURE MODELING CAPABILITY TO SELECT AND OPTIMIZE THE MATERIAL AND CONTROL PARAMETERS. THE PROPOSED EFFORT WILL 1. SPECIFY SURFACE BRDFs THAT PRODUCE CONTRAST RADIANCES THAT ARE BELOW DETECTION THRESHOLD; 2. IDENTIFY TECHNOLOGIES AND MATERIAL PROPERTIES THAT COULD POTENTIALLY ACHIEVE THE SPECIFIED BRDFs; 3. SPECIFY NEEDED MODIFICATIONS, IF ANY, TO AERODYNE'S SIGNATURE MODELING CODE SPIRITS; AND 4. ASSESS THE FEASIBILITY OF ACHIEVING THE SPECIFIED BRDFs WITH EXISTING MODULATION TECHNOLOGIES AND IR MATERIALS.

SUBMITTED BY

AIS SYSTEMS INC
375 N BROADWAY
JERICHO, NY 11753
CONTRACT NUMBER:
DAVID KOPPEL
TITLE:
ENHANCED STANDARDIZATION OF MATE SOFTWARE
TOPIC# 147 OFFICE: AFWAL/ASD IDENT#: 27005

THE MATE PROGRAM WAS DESIGNED TO PROVIDE HARDWARE AND SOFTWARE STANDARDS TO THE ATE INDUSTRY. IN PARTICULAR, MATE SOFTWARE WAS INTENDED TO USE A STANDARDIZED TEST LANGUAGE - ATLAS - ON A STANDARDIZED TEST EXECUTIVE, THE MTE, ALL RUNNING ON A STANDARD OPERATING SYSTEM, THE MOS. THE MOS WAS DESIGNED TO BE EASILY REHOSTABLE AND HAS, IN FACT, BEEN REHOSTED TO SEVERAL HARDWARE CONFIGURATIONS. HOWEVER, WHILE THE TEST LANGUAGE CHOSEN FOR MATE WAS PICKED ON THE BASIS OF ITS WIDE USAGE IN THE ATE INDUSTRY, THE MOS WAS WRITTEN LOSSELY BASED ON A NUMBER OF EARLY VERSIONS OF UNIX WITH NO PARTICULAR EFFORT TO MATCH A PRECISE INDUSTRY STANDARD. INDEED IT COULD NOT, AS NO SUCH STANDARD EXISTED. RECENTLY THE USAF IN ITS RFP FOR AFCAC PROJECT 251 ESTABLISHED AT&T'S SVID AS THE STANDARD FOR UNIX WITH THE EXCEPTION THAT IT WOULD EVENTUALLY BE SUBSUMED UNDER THE IEEE POSIX STANDARD. AT THIS POINT IT WOULD BE WORTHWHILE TO ANALYZE THE MCSS IN LIGHT OF SVID AND POSIX AND DETERMINE WHAT STEPS SHOULD BE TAKEN TO MAKE THE MCSS CONFORM TO THE NEW USAF STANDARD.

AKM ASSOC INC
635 MARINER'S ISLAND BLVD - #205
SAN MATEO, CA 94404
CONTRACT NUMBER:
M L WRIGHT
TITLE:
REMOTE DETECTION OF FUEL VAPORS AND EXHAUST FUMES
TOPIC# 152 OFFICE: AFWAL/ASD IDENT#: 27013

THIS PROPOSAL INVOLVES THE USE OF ADVANCED LASER REMOTE SENSING

SUBMITTED BY

TECHNIQUES FOR THE DETECTION AND IDENTIFICATION OF FUEL VAPORS AND EXHAUST FUMES. THE FOCUS OF THE PROPOSED RESEARCH IS TO MAKE AN INITIAL ESTIMATE OF THE FEASIBILITY OF USING REMOTE LADAR SPECTROSCOPY TO DETECT FUEL VAPORS AND EXHAUST FUMES. IF THE INITIAL ESTIMATES ARE FAVORABLE, A DETAILED STUDY OF DECISION FEASIBILITY WOULD BE DONE TO ASSURE THAT THE APPROACH IS SOUND FROM ALL POINTS OF VIEW. IN PHASE II, A SYSTEM SPECIFICALLY DESIGNED TO DETECT SUCH MATERIALS WOULD BE DESIGNED AND A PROTOTYPE SYSTEM WOULD BE BUILT AND DEMONSTRATED. THE PROPOSED RESEARCH WOULD INTRODUCE A NUMBER OF INNOVATIONS TO THIS PROJECT, INCLUDING (1) TECHNIQUES FOR INTERFERENCE SUPPRESSION THAT CAN IMPROVE THE SENSITIVITY BY A FACTOR OF TEN OR MORE, (2) SOPHISTICATED SPECTRAL MANIPULATION AND PROCESSING TECHNIQUES INVOLVING ARTIFICIAL INTELLIGENCE, THAT CAN INCREASE PERFORMANCE SUBSTANTIALLY, AND (3) WAVE-LENGTH OPTIMIZATION TECHNIQUES THAT CAN PRODUCE THE HIGHEST PERFORMANCE IN REAL-TIME SYSTEMS THAT ARE CONSTRAINED BY VERY SHORT "LOOK" TIMES. THESE AND OTHER INNOVATIONS CAN INCREASE SYSTEM PERFORMANCE SUBSTANTIALLY, AND CAN MAKE THE DIFFERENCE BETWEEN A SYSTEM THAT IS ACCEPTABLE AND ONE THAT IS NOT.

ALESAT CORP
321 N BROAD ST
FAIRBORN, OH 45324
CONTRACT NUMBER:
WILLIAM A McCULLOCH
TITLE:
NEW CONCEPTS AND INNOVATIONS FOR AERONAUTICAL SYSTEMS/SUBSYSTEMS (COMPONENT BREAKOUT)
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 26992

THE PROBLEM OF INSUFFICIENT COMPETITION IS CREATING HARDSHIPS FOR THE AIR FORCE IN TERMS OF EXCESSIVE COSTS AND LOWERED PERFORMANCE. THE COMPONENT BREAKOUT ACTIVITY IS THE FIRST STEP IN THE TRANSITION TO COMPLETITION FOR AN ITEM/SUBSYSTEM. THIS PROJECT OFFERS TO EXPLORE THE NATURE OF THE BREAKOUT PROCESS, DETERMINE TRUE COSTS AND OTHER EFFECTS, AND RECOMMEND CHANGES THAT WILL PRODUCE TRUE COMPETITION AND ECONOMIC EFFICIENCY.

ALESAT CORP
321 N BROAD ST
FAIRBORN, OH 45323
CONTRACT NUMBER:
STANLEY A TREMAINE
TITLE:
DESIGN OF CONCEPTUAL INNOVATION
TOPIC# 28 OFFICE: ESD/XRB IDENT#: 28594

SUBMITTED BY

THIS PROPOSAL IS TO PERFORM A RESEARCH AND EVALUATION INTO THE TECHNICAL METHODOLOGY BY WHICH LONG RANGE DEVELOPMENT PLANNING IS PERFORMED AT THE ELECTRONIC SYSTEMS DIVISION. THE OBJECTIVE OF THIS PROPOSED RESEARCH IS TO DEVELOP INNOVATIVE CONCEPTS FOR THE METHODOLOGY, PROCESS AND PROCEDURE FOR OPERATION OF THE ESD LONG RANGE DEVELOPMENT PLANNING FUNCTION. THE FINAL PURPOSE IS TO DEVELOP THE SET OF TOOLS THAT CAN MAKE THE ESD DEVELOPMENT PLANNING FUNCTION MORE EFFECTIVE IN CONCEIVING AND BIRTHING THE FUTURE ELECTRONIC AND COMMAND AND CONTROL SYSTEMS. AS A PART OF THIS RESEARCH, AN EVALUATION WILL BE MADE, USING PREDICTIVE ANALYSIS TECHNIQUES, TO DETERMINE AND DEVELOP THE METHODOLOGY FOR THE ESD TO BECOME THE SINGLE SERVICE AGENCY TO CONCEIVE AND BRING INTO EARLY DEVELOPMENT ELECTRONIC AND COMMAND AND CONTROL SYSTEMS AT THE NATIONAL LEVEL OF ASSIGNMENT.

ALTUS CORP
1610 CRANE CT
SAN JOSE, CA 95112
CONTRACT NUMBER:
J PHILLIPS
TITLE:
ADVANCED BATTERY POWER SYSTEM TECHNOLOGY
TOPIC# 222 OFFICE: BMO/MYSC IDENT#: 28640

RECHARGEABLE LITHIUM POWER SYSTEMS USING SULFUR DIOXIDE AS THE ELECTROLYTE SOLVENT ARE PRIME CANDIDATES FOR THE ADVANCED BASING SYSTEM BATTERY. SULFUR DIOXIDE ELECTROLYTES HAVE THE DISTINCT ADVANTAGE OVER ALL ORGANIC ELECTROLYTES OF THERMODYNAMIC STABILITY TOWARDS LITHIUM, ALBEIT THEIR VAPOR PRESSURE VERSUS SOLUTE CONCENTRATION IS MORE VARIABLE. THE ELECTROLYTE VAPOR PRESSURE CAN BE BOTHERSOME FOR LARGE BATTERIES DESIGNS OF SEVERAL KILOWATTS AND UP. THIS PROGRAM EXPLORES BOTH AN ENGINEERING AND CHEMICAL SOLUTION TO HANDLING THE SULFUR DIOXIDE ELECTROLYTE VAPOR PRESSURE IN LARGE PRISMATIC CELLS. THE ENGINEERING APPROACH INVOLVES STRESS ANALYSIS OF CELL DESIGNS AS A FUNCTION OF TEMPERATURE AND LOADING FOLLOWED BY PHYSICAL TESTING OF THE MOST PROMISING DESIGN. THE CHEMICAL APPROACH IS TO LOWER THE VAPOR PRESSURE BY INCREASING THE SOLUTE CONCENTRATION, THEN TO TEST THE IMPACT OF INCREASED SOLUTE CONCENTRATION ON CELL RATE

SUBMITTED BY

CAPACITIES AND CYCLE LIFE USING A RECHARGEABLE LITHIUM/SULFUR DIOXIDE SYSTEM FOR TEST PURPOSES. THE PROGRAM OBJECTIVE IS TO SET DESIGN CONCEPTS AND GUIDE LINES.

AMBER ENGINEERING INC
5756 THORNWOOD DR
GOLETA, CA 93117
CONTRACT NUMBER:
JOHN BLACKWELL
TITLE:
VARIABLE SAMPLE RATE FORWARD LOOKING INFRARED (FLIR) CONCEPTURAL DESIGN
TOPIC# 77 OFFICE: AFWAL/ASD IDENT#: 26895

AUTOMATIC TARGET RECOGNIZER (ATR) COMPUTERS ARE CAUSING A REVOLUTION IN THE DESIGN OF FORWARD LOOKING INFRARED (FLIR) SENSORS. HISTORICALLY, FLIRs HAVE UNDER-SAMPLED BECAUSE OF THE SMALL NUMBER OF DETECTORS AVAILABLE ON THE FOCAL PLANE ARRAYS IMAGERY. HOWEVER, FPA DETECTOR DENSITIES HAVE IMPROVED AND ATRs ARE SENSITIVE TO ALIASING. AS A RESULT, SAMPLING RATE IS NOW CONSIDERED TO BE A CRITICAL DESIGN PARAMETER. NEW FLIR DESIGN AND PERFORMANCE FIGURES OF MERIT CANNOT BE VERIFIED SINCE ALL EXISTING SENSORS ARE LIMITED TO ONE SAMPLE RATE. IN PHASE I OF THIS EFFORT, AN INNOVATIVE DESIGN OF A VARIABLE SAMPLE RATE LABORATORY FLIR WILL BE DEVELOPED THAT, WHILE NOT PRACTICAL FOR A OPERATIONAL SYSTEM, WILL BE IDEAL FOR THE PROPOSED LABORATORY UNIT. COMBINING A STARTING FPA WITH A STEP-STARE TWO AXIS SCANNER WILL BE STUDIED. THE FLIR WILL GENERATE TV LINE RATES SO THAT THE DATA CAN BE DISPLAYED TO AN OPERATOR WITHOUT IMAGE TEARING ARTIFACTS AND DETECTOR AND APERTURE SIZES WILL BE SELECTED TO PROVIDE ANTI-ALIASING FILTERS. PHASE 2 WILL CONSIST OF THE FINAL DESIGN, FLIR FABRICATION AND THE COLLECTION OF DATA TO VERIFY THE FIGURES OF MERIT.

AMERASIA TECHNOLOGY INC
620-1 HAMPSHIRE RD
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER:
DR TEONG LIM
TITLE:
AN INNOVATIVE STEREOSCOPIC DISPLAY FOR BATTLE MANAGEMENT USING A BARIFOCAL FRESNEL LENS
TOPIC# 40 OFFICE: RADC/XPX IDENT#: 28565

SUBMITTED BY

THERE IS A NEED FOR A BATTLE MANAGEMENT 3-D DISPLAY SYSTEM TO DISPLAY BATTLE SITUATIONS IN TERMS OF TERRAIN, AIR AND GROUND FORCES FOR RAPID SITUATION ASSESSMENT. AN INNOVATIVE REAL TIME STEREOSCOPIC LARGE AREA 3-D DISPLAY SYSTEM IS PROPOSED. THE PROPOSED SYSTEM HAS A DISPLAY VOLUME OF 3'x3'x3' AND IS CAPABLE OF MULTI-COLOR OPERATION WITH HIGH BRIGHTNESS. AN INNOVATIVE VARIABLE FOCAL LENGTH FRESNEL LENS IS DRIVEN BY PC COMPATIBLE SOFTWARE TO PRODUCE A LARGE IMAGE VOLUME IN REAL TIME. THE INNOVATIVE APPLICATION OF A PHASE LOCKED BIT SLICE CO-PROCESSOR PRODUCES COLOR ANIMATION IN REAL TIME. THE ADVANTAGES OF THE PROPOSED APPROACH ARE REAL TIME OPERATION, LARGE DISPLAY VOLUME, LOW COST, PC COMPATIBILITY, HIGH SPEED GRAPHICS WITH ANIMATION AND COLOR, SOLID STATE RELIABILITY, AND SIMPLICITY OF CONSTRUCTION. IN PHASE I, SIMULATION STUDIES OF THE VARIABLE FOCUS FRESNEL LENS WILL BE PERFORMED AND PROOF OF CONCEPT DEMONSTRATED. ALSO, A BIT SLICE CO-PROCESSOR FOR SOFTWARE TO DRIVE THE 3-D DISPLAY WILL BE DESIGNED AND ITS PERFORMANCE WILL BE SIMULATED. IN PHASE II, A PROTOTYPE 3-D DISPLAY SYSTEM FOR BATTLE MANAGMENT WILL BE CONSTRUCTED AND ITS PERFORMANCE EVALUATED.

AMERASIA TECHNOLOGY INC
620-1 HAMPSHIRE RD
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER:
DR B LAO
TITLE:
MONOLITHIC GaAs MIMIC EXOATMOSPHERIC JAMMER
TOPIC# 198 OFFICE: BMO/MYSC IDENT#: 28613

A MINIATURE AND LIGHT-WEIGHT JAMMER SYSTEM UTILIZING ACOUSTIC CHARGE TRANSPORT (ACT) DEVICE AND OTHER GaAs CIRCUITS IS PROPOSED FOR A MONOLITHIC GaAs MIMIC IMPLEMENTATION. THE JAMMER WITH A MINIMUM BANDWIDTH OF 200 MHz WILL PROVIDE WAVEFORM-SPECIFIC MULTIPLE JAMMING ECHOES WITH PROGRAMMABLE DELAYS AND DOPPLER SHIFTS FOR RANGE GATE PULL-OFF AND ANTI-MTI JAMMING. THE DESIGN AND IMPLEMENTATION OF THE KEY GaAs CIRCUITS ARE DISCUSSED. PHASE I PROGRAM WILL PROVIDE A DETAILED DESIGN OF THE JAMMER SYSTEM DOWN TO THE TRANSISTOR LEVEL TOGETHER WITH THE DESIGN OF THE ACT DEVICE, SYSTEM INTEGRATION, GaAs MIMIC FOUNDRY SELECTION, AND JAMMER PERFORMANCE ANALYSIS.

SUBMITTED BY

AMERICAN ADVANCED TECHNOLOGIES INC
7630 SHARON LEE DR
ARLINGTON, TX 76017
CONTRACT NUMBER:
DR W C NUNNALLY
TITLE:
DESIGN OF A STAR HYPERVELOCITY EML SYSTEM FOR AIR FORCE REQUIREME
TOPIC# 4 OFFICE: AD/PMR IDENT#: 23313

THE WORK PROPOSED WILL RESULT IN A COMPLETE, PRELIMINARY SYSTEM DESIGN OF AN ELECTROMAGNETIC PROJECTILE LAUNCHER, BASED ON THE STAR EML CONCEPT DEVELOPED BY AMERICAN ADVANCED TECHNOLOGIES. THE COMPLETED DESIGN WILL PERMIT THE AIR FORCE TO COMPARE THE PERFORMANCE, WEIGHT AND SIZE OF THE STAR EML WITH OTHER CONCEPTS BEING INVESTIGATED. THE STAR EML SYSTEM IS OF INTEREST TO THE AIR FORCE BECAUSE THE STAR SYSTEM CAN TRANSFER THE MOST ENERGY TO MULTI-KILOGRAM PROJECTILES PER UNIT LAUNCHER LENGTH WHEN COMPARED TO RAIL GUNS, RAIL GUN DERRIVATIVES, AND COIL GUNS, POWER CONDITIONING SYSTEM MINIMIZES RESISTIVE LOSSES AND INDUCTIVE ENERGY STORAGE REQUIRES, NO ACTIVE SWITCHING OR OPENING SWITCHES, DELIVERS AN EQUAL AMOUNT OF ENERGY TO THE PROJECTILE ALONG EACH UNIT LENGTH OF LAUNCHER, HANDLES ONLY THE ENERGY BEING TRANSFERRED TO THE PROJECTILE PER UNIT LENGTH, ALL OF WHICH RESULTS IN THE MOST EFFICIENT (> 90%), MINIMUM WEIGHT AND VOLUME POWER CONDITIONING SYSTEM POSSIBLE. THE STAR EML GEOMETRY ELIMINATES THE MASS ABLATION/VELOCITY SATURATION PROBLEMS EXPERIENCED BY RAIL GUNS WHILE PROVIDING MAGNETIC PROJECTILE LEVITATION AND CENTERING. PHASE II OF THIS PROGRAM WILL COMPLETE THE DESIGN, FABRICATION, OPERATION OF A SCALED DOWN PROOF OF PRINCIPLE EXPERIMENT AS DETERMINED BY AIR FORCE REQUIREMENTS AND THE FUNDING AVAILABLE FOR PHASE II.

AMERICAN COMPOSITE TECHNOLOGY
306 NORTHERN AVE
BOSTON, MA 02210
CONTRACT NUMBER:
DR JEROME FANUCCI
TITLE:
AN INVESTIGATION OF MASS-PRODUCED EXPENDABLE LAUNCH VEHICLE CONCE
TOPIC# 164 OFFICE: AFSD IDENT#: 27101

SUBMITTED BY

EVERY US LAUNCH SYSTEM DEVELOPED TO DATE HAS ASSUMED THE NEED FOR EXTREME RELIABILITY AND MAXIMUM OBTAINABLE PERFORMANCE IN THE PRIMARY COMPONENTS OF THE STRUCTURE AND PROPULSION SYSTEM. THIS APPROACH STRETCHES THE LIMITS OF AVAILABLE TECHNOLOGY, AND HAS REPEATEDLY RESULTED IN LAUNCH SYSTEMS WHICH CAN NOT PUT MATERIAL INTO EARTH ORBIT AT AN ACCEPTABLE COST. THE SPACE SYSTEM DESIGN COMMUNITY HAS DEVOTED LITTLE OR NOT EFFORT TO THE INVESTIGATION OF FAIL-SAFE SYSTEMS. A FAIL-SAFE LAUNCH VEHICLE WOULD BE DESIGNED FROM THE OUTSET UNDER THE ASSUMPTION THAT SOME OF ITS VERY HIGHLY REDUNDANT, LOW-COST SYSTEMS WOULD FAIL DURING LAUNCH. SUCH A SYSTEM MIGHT, FOR EXAMPLE, USE TENS OF HUNDREDS OF SMALL, IDENTICAL ENGINES DESIGNED TO PASSIVELY FAIL IN THE PRESENCE OF OUT-OF-SPEC CONDITIONS IN A WAY THAT PRODUCES NO THREAT TO THE REMAINING VEHICLE SYSTEMS. SINCE AN ACTIVE SPACE PROGRAM WOULD EMPLOY MANY THOUSANDS OF THESE EXPENDABLE ENGINES EVERY YEAR, THE COST AND QUALITY BENEFITS OF LARGE SCALE AUTOMATED PRODUCTION COULD FINALLY MOVE THE SPACE INDUSTRY AWAY FROM THE SPECIAL-PURPOSE DESIGN AND SMALL PRODUCTION RUN ERA THAT HAS HINDERED THE WIDESPREAD USE OF SPACE. AMERICAN COMPOSITE TECHNOLOGY PROPOSES TO INVESTIGATE THE DESIGN OF SUCH A LAUNCH SYSTEM IN THE FOLLOWING PAGES.

AMERICAN COMPOSITE TECHNOLOGY
306 NORTHERN AVE
BOSTON, MA 02210
CONTRACT NUMBER:
DR JEROME FANUCCI
TITLE:
AN INVESTIGATION OF MATERIALS AND AUTOMATED PRODUCTION METHODS FO SMART STRUCTURES
TOPIC# 169 OFFICE: AFAL IDENT#: 27111

MANY POTENTIAL SPACE SYSTEMS WILL REQUIRE STRUCTURES CAPABLE OF MAINTAINING EXTREMELY TIGHT TOLERANCES ON DIMENSIONS AND VIBRATIONS. ONE APPROACH TO ACHIEVING THE NECESSARY TOLERANCES IS TO EMPLOY TRUSSES MADE USING SMART STRUCTURES. A SMART STRUCTURE IS ONE IN WHICH THE CONTROL, SENSING AND ACTUATION FUNCTIONS ARE INTEGRATED INTO THE MATERIAL WHICH MAKES UP THE INDIVIDUAL TRUSS ELEMENTS. PROPERLY SEQUENCED FORCES ARE APPLIED TO THE BEAMS USING PIEZO-

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ELECTRIC CRYSTALS WHICH CHANGE SIZE IN RESPONSE TO APPLIED ELECTRIC FIELDS. VERY LITTLE WORK HAS BEEN DONE TO INVESTIGATE MATERIAL OPTIONS AND PRODUCTION METHODS FOR SMART STRUCTURES. ACT PROPOSES TO INVESTIGATE THESE ALTERNATIVES, AND TO DEVELOP OUR RECOMMENDATIONS FOR THE OPTIMUM COMBINATION OF MATERIALS AND PRODUCTION TECHNOLOGY NEEDED TO PRODUCE SMART BEAMS.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 14221
CONTRACT NUMBER:
CESAR BANDERA
TITLE:
NEW CONCEPTS AND INNOVATIONS FOR AERONAUTICAL SYSTEMS/SUBSYSTEMS: SUPPRESSOR ENVIRONMENT CHARACTERIZER
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 26993

ACCURATE RF ENVIRONMENT CHARACTERIZATION IS REQUIRED TO PRODUCE REALISTIC REQUIREMENTS FOR EW SYSTEMS. THE SUPPRESSOR ENVIRONMENT CHARACTERIZER WILL INTEGRATE THE SUPPRESSOR C3 OPERATION AND DECISION MODEL WITH A STATE-OF-THE-ART PULSE MODEL TO PRODUCE THE DATA NECESSARY TO ANALYZE THE RF ENVIRONMENT.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 14221
CONTRACT NUMBER:
CESAR BANDERA
TITLE:
DEVELOPMENT OF INTERACTIVE THREATS FOR COMBAT MISSION SIMULATION
TOPIC# 153 OFFICE: AFWAL/ASD IDENT#: 27014

TRAINING FOR MODERN TACTICAL COMBAT MISSIONS REQUIRES THE REAL TIME SIMULATION OF MULTIPLE AND DIVERSIFIED REACTIVE COORDINATED THREATS. CURRENT THREAT SIMULATION METHODOLOGIES AND SYSTEMS ... TO MEET THIS REQUIREMENT IN FOUR WAYS: 1) LACK OF DIVERSITY IN SIMULATEABLE THREAT TYPES, 2) INADEQUATE DECISION PROCESS MODELING RESULTING IN

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INACCURATE THREAT ACTIVITY, 3) SUBOPTIMUM ... OF MANPOWER, AND 4) LACK OF COORDINATED THREAT ACTIVITY BY INADEQUATE THREAT C3 MODELING RESULTING IN UNDERESTIMATED THREAT PERFORMANCE. AMHERST SYSTEMS PROPOSED TO DEVELOP A REAL TIME REACTIVE COORDINATED THREAT SIMULATOR FOR TACTICAL COMBAT MISSION TRAINING. THE ABOVE CURRENT SIMULATION LIMITATIONS WILL BE EXPLICITLY ADDRESSED. THE DESIGN WILL INCORPORATE THE PROVEN BENEFITS OF FUNCTIONAL MODULARITY AND EVENT DRIVEN OPERTION. RULE BASED DECISION LOGIC AND C3 NETWORK MODELS WILL ENSURE ACCURATE THREAT ACTIVITY IN THE CONTEXT OF THREAT C3. THREAT SYSTEMS SUCH AS WEAPONS, AERODYNAMICS AND ACQUISITION AND TRACKING RADARS WILL BE SIMULATED BY PARAMETICS MODELS. THE THREAT SYSTEM MODELS WILL BE REPROGRAMMABLE AND WILL ACCEPT PARAMETER LISTS DESCRIBING THE CAPABILITIES AND RESOURCES OF THE THREAT SYSTEMS. DIFFERENT THREATS WILL BE IMPLEMENTABLE BY THE SPECIFICATION OF DIFFERENT PARAMETERS FOR THE THREAT SYSTEMS AND DIFFERENT RULES FOR THE DECISION LOGIC AND C3. SINCE THE THREAT EXISTS ENTIRELY AS PROCESSES IN THE SIMULATOR COMPUTER, ADDITIONAL THREATS WILL BE SIMULTANEOUSLY SIMULATED BY RUNNING MULTIPLE PROCESSES ON THE COMPUTER AND/OR BY CLUSTERING COMPUTERS.

AMPARO CORP
125 LINCOLN AVE - STE 216
SANTA FE, NM 87501
CONTRACT NUMBER:
JOHN K PRENTICE
TITLE:
ARMAMENT RESEARCH ANALYSIS
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23250

THE U.S. AIR FORCE HAS A NEED TO DEVELOP A GREATER CAPABILITY OF ANALYZING MUNITIONS/ARMAMENT INTERACTIONS. IT IS PROPOSED THAT THE "HULL CODE" BE MODIFIED IN A WAY THAT WILL SIGNIFICANTLY IMPROVE ITS ABILITY TO DO THIS. THE IMPLEMENTATION OF VARIOUS NUMERIC IMPROVEMENTS WILL BE ACCOMPLISHED AND A TWO DIMENSIONAL PROOF OF CONCEPT TEST WILL BE CONDUCTEL.

ANADIGICS INC
35 TECHNOLOGY DR
WARREN, NJ 07060
CONTRACT NUMBER:
SARJIT BHARI
TITLE:
HIGH DYNAMIC RANGES MIXERS
TOPIC# 155 OFFICE: AFSTC IDENT#: 27085

SUBMITTED BY

HIGH DYNAMIC RANGE MIXERS ARE BECOMING MORE IMPORTANT AS THE COMPLEXITY OF THE ELECTRONIC WARFARE SYSTEMS INCREASE. SINCE IT IS USUALLY THE FIRST OR SECOND DEVICE FROM THE RF INPUT, THE PERFORMANCE OF THE MIXER IS CRITICAL IN THE OVERALL OPERATION OF THE SYSTEM. THE DESIGN OF THE PRESENT DAY MIXERS IN THE MILLIMETER WAVEBANDS ARE BASED ON SCHOTTKY BASED DIODES IN THE SELF BIAS MODE AND ADVANCEMENT IN THE DOUBLE BALANCED STRUCTURES HAS BEEN EITHER NON-EXISTENT OR VERY SLOW AND UNECONOMICAL. THE DOUBLE BALANCED STRUCTURE OFFERS THE BEST PERFORMANCE AS FAR AS THE REJECTIONS OF THE INPUT SIGNALS AND INTERMODULATION PERFORMANCE IS CONCERNED. THE LIMITING FACTOR OF THE MM WAVE DOUBLE BALANCED STRUCTURE IS THE DESIGN OF THE PASSIVE BALUN. THIS PROPOSAL WILL DETAIL A HIGH DYNAMIC MIXER DESIGN, TOGETHER WITH A DETAILED BALUN DESIGN.

ANALATOM INC
1977 CONCOURSE DR
SAN JOSE, CA 95131
CONTRACT NUMBER:
DR GABRIEL LAUFER
TITLE:
AN INSTRUMENT FOR THE SIMULTANEOUS MEASUREMENT OF VELOCITY TEMPERATURE AND DENSITY OF UNSEEDED AIR-FLOWS
TOPIC# 230 OFFICE: AFOSR/NA IDENT#: 28649

WE PROPOSE TO DEVELOP A NEW TECHNIQUE FOR THE MEASUREMENT OF AIR VELOCITY. THE TECHNIQUE WILL USE AN ARF LASER TO FORM CO TRACERS BY DISSOCIATING ATMOSPHERIC CO(2). THE SAME LASER PULSE WILL ALSO BE USED TO INTERROGATE THE TRACERS. WE ARE ALREADY DEVELOPING A LASER-INDUCED FLUORESCENCE TECHNIQUE FOR THE MEASUREMENT OF AIR TEMPERATURE AND DENSITY. WE WILL COMBINE THE TWO SYSTEMS TO FORM A DEVICE FOR SINGLE PULSE MEASUREMENT OF THREE INDEPENDENT FLOW PARAMETERS. THE SYSTEM WILL BE MOST SUITED FOR COLD FLOW HYPERSONIC (3-20 MACHS) WIND TUNNEL APPLICATIONS. IT WILL RELY ON THE SCATTERING FROM NATURAL AIR CONSTITUENTS (N(2), O(2), CO(2)) WITH NO SEEDING REQUIREMENTS AND WITH THE NEED FOR ONLY ONE ACCESS WINDOW. THESE FEATURES MAKE THIS INTEGRATED SYSTEM A CANDIDATE INSTRUMENT FOR BOTH WIND TUNNEL AND ON-FLIGHT MEASUREMENTS.

ANAMET LABS INC
3400 INVESTMENT BLVD
HAYWARD, CA 94545
CONTRACT NUMBER:
STEVEN G HARRIS
TITLE:
USE OF A DIGITAL IMAGE DATABASE IN DETERMINING THE FRACTAL PROPERTIES OF SOIL MICROSTRUCTURE
TOPIC# 181 OFFICE: AFWL/PRC IDENT#: 27130

SUBMITTED BY

AN INNOVATIVE AND EFFICIENT APPROACH TO DETERMINING THE FRACTAL PROPERTIES OF SOIL MICROSTRUCTURE IS DEFINED WHICH EMPLOYS INTEGRATED DATABASE AND IMAGE PROCESSING TECHNIQUES. PHASE I ASPECTS OF THIS SBIR RESEARCH ARE PRIMARILY CONCERNED WITH DETERMINING WHETHER SOIL MICROSTRUCTURE CAN BE SUCCESSFULLY CHARACTERIZED USING FRACTALS. THE INTEGRATED DIGITAL IMAGE DATABASE APPROACH DESCRIBED IN THE PROPOSAL PROVIDES THE BASIS FOR STREAMLINED DATA REDUCTION IN PHASE I, AS WELL AS FOR DERIVING CORRELATIONS BETWEEN TEST DATA AND FRACTAL DIMENSIONS IN FOLLOW-ON WORK. BOTH OPTICAL AND ELECTRON MICROSCOPY TECHNIQUES WILL BE EMPLOYED IN EXAMINING SOIL MICROSTRUCTURES, AND THE RESULTING MAGNIFIED IMAGES WILL BE DIGITIZED AND PLACED DIRECTLY INTO A MICRO-COMPUTER-BASED DATABASE. METHODS FOR DERIVING IMAGE CONTOURS AND THE RESULTING FRACTAL DIMENSIONS FROM THESE IMAGES ARE DESCRIBED, BASED UPON ENHANCEMENT OF EXISTING ANAMET-DEVELOPMENT IMAGE MANIPULATION SOFTWARE. THEREFORE, IN DETERMINING WHETHER SOIL MICROSTRUCTURE CAN BE CHARACTERIZED USING FRACTALS, ANAMET WILL ALSO BE ESTABLISHING A DATABASE OF MICROSTRUCTURL IMAGES AND SOIL PROPERTIES WHICH CAN BE DIRECTLY EXTENDED TO INCLUDE MECHANICAL TEST DATA IN FOLLOW-ON STUDIES TO ASSIST IN DEFINING RELATIONSHIPS BETWEEN FRACTAL DIMENSIONS AND MECHANICAL PROPERTIES OF SOILS.

APPLIED LOGIC SYSTEMS INC
PO BOX 90 - UNIVERSITY STATION
SYRACUSE, NY 13210
CONTRACT NUMBER:
KENNETH A BOWEN
TITLE:
INTELLIGENT ORGANIC COMPOUNDS AND FUELS DATABASE
TOPIC# 132 OFFICE: AFWAL/ASD IDENT#: 26976

MANY COMMERCIAL, GOVERNMENTAL, AND MILITARY ORGANIZATIONS TODAY MUST DEVELOP LARGE HIGHLY FLEXIBLE AND "INTELLIGENT" DATABASES IN SUCH A WAY THAT COMPLEX SYMBOLIC REASONING AND NUMERICAL COMPUTATION MUST BE CLOSELY INTEGRATED - FOR EXAMPLE, A DATABASE OF THERMODYNAMIC PROPERTIES OF ORGANIC FUELS SUPPORTING ANALYSIS AND SELECTION. THERE WILL BE LARGE VOLUMES OF NUMERIC AND TEXT DATA, WHICH MAY BE UNCERTAIN AND INCOMPLETE. NO EXISTING COMMERCIAL DBMS SYSTEMS CAN SUPPORT SUCH COMPLEXITY OR ADVANCED PROGRAMMING, AND NO AI LANGUAGES OR

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SHELLS PROVIDE SUFFICIENTLY ROBUST DATA MANAGEMENT TOOLS. MOREOVER, INTELLIGENT APPLICATIONS GENERALLY MUST BE ABLE TO ACCESS DATA PROVIDED BY OTHER APPLICATIONS STILL RUNNING ON THE TRADITIONAL DBMS CONTAINING THE ORIGINAL PRIMITIVE DATA. THE SOLUTION IS TO PROVIDE DIRECT INTERFACES BETWEEN AI PROGRAMMING LANGUAGES AND RELATIONAL DBMSs, AS HAS BEEN DONE BY APPLIED LOGIC SYSTEMS, INC., WITH ITS PROLOG-DBMS INTERFACES. THE SITUATION CREATES A DEMAND AND AN OPPORTUNITY TO EXTEND THESE POWERFUL TOOLS TO CONSTRUCT TRULY INTELLIGENT DATABASES, SUCH AS THE REQUESTED FUELS DATABASE. THE PRESENT PROPOSAL ADDRESSES THE APPLICATION AND EXTENSION OF THE PRESENT TOOLS TO THE CONSTRUCTION OF AN INTELLIGENT FUELS DATABASE, AND THE ABSTRACTION/EXTRACTION OF THE GENERAL TOOLS FOR APPLICATION TO SIMILAR SETTINGS.

APPLIED MICROWAVE PLASMA CONCEPTS INC
2075-N CORTE DEL NOGAL
CARLSBAD, CA 92009
CONTRACT NUMBER:
RAPHAEL A DANDL
TITLE:
MULTIPLE FREQUENCY ELECTRON CYCLOTRON HEATING OF ENERGETIC ELECTRONS FOR IONOSPHERIC MODIFICATION EXPERIMENT
TOPIC# 177 OFFICE: AFGL IDENT#: 27124

A ROBUST METHOD FOR ACHIEVING STOCHASTIC HEATING OF IONOSPHERIC ELECTRONS TO RELATIVEISTIC ENERGIES IS PROPOSED THAT USES MULTIPLE FREQUENCY ELECTRON CYCLOTRON HEATING (MFECH): ELECTROMAGNETIC RADIATION FROM GROUND BASED ANTENNAS IS FOCUSED ON A SUITABLE REGION OF THE EARTH'S MAGNETOSPHERE; AND THE FREQUENCY SPECTRUM OF THE RADIATION IS CHOSEN TO PREVENT THE OCCURRENCE OF RELATIVISTIC LIMIT CYCLES THAT MIGHT RESTRICT THE ACHIEVABLE ELECTRON ENERGIES TO LOW VALUES. THE AMPHED EXPERIMENTAL FACILITY, NOW IN OPERATION AT AMPC, WILL BE USED TO DEMONSTRATE EFFECTIVE ELECTRON HEATING IN A WEAKLY INHOMOGENEOUS MAGNETIC FIELD USING MFECH. SUBSEQUENTLY, THE LABORATORY RESULTS WILL BE SCALED UP USING APPROPRIATE THEORETICAL MODELS TO PERMIT AN EVALUATION OF THIS TECHNIQUE FOR SELECTED ACTIVE EXPERIMENTS IN SPACE. OF PARTICULAR INTEREST IS THE ALFVEN MASER CONCEPT FOR PUMPING HIGH ENERGY IONS AND ELECTRON OUT OF THE EARTH'S RADIATION BELTS. GIVEN SUCCESSFUL RESULTS FROM THE PHASE I DEMON-

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STRATION OF ELECTRON HEATING, AMPHED WILL BE USED IN PHASE II TO SIMULATE CRITICAL ASPECTS OF THE ALFVEN MASER CONCEPT.

APPLIED MICROWAVE PLASMA CONCEPTS INC
2075-N CORTE DEL NOGAL
CARLSBAD, CA 92009
CONTRACT NUMBER: F49620-88-C-0101
DR GARETH E GUEST
TITLE:
A TWO-STREAM PLASMA ELECTRON MICROWAVE SOURCE FOR HIGH POWER MILLIMETER WAVE GENERATION
TOPIC# 241 OFFICE: AFOSR/NP IDENT#: 28660

A NOVEL HIGH POWER MILLIMETER/MICROWAVE SOURCE IS PROPOSED IN WHICH TWO INTERPENETRATING STREAMS OF ELECTRONS, FLOWING THROUGH A BACKGROUND PLASMA IN A STATIC MAGNETIC FIELD ARE USED TO GENERATE A HOT-ELECTRON PLASMA THAT IS CONFINED IN A MIRROR-LIKE MAGNETIC FIELD IN THE FORM OF A FOLDED-CUSP MAGNETIC CONFIGURATION. ENERGY STORED IN THE ANISOTROPIC, HOT-ELECTRON PLASMA IS THEN USED TO AMPLIFY UNSTABLE PLASMA WAVES TO LARGE AMPLITUDE BY SELECTIVE DEACTIVATION OF MECHANISMS THAT STABILIZE THE HOT-ELECTRON PLASMA DURING THE ENERGY ACCUMULATION PHASE WHEN THE DENSITY OF HOT ELECTRONS IS RAPIDLY INCREASED THROUGH THE BEAM-PLASMA INTERACTIONS. THE PHASE I PROGRAM WILL YIELD A DESIGN FOR AN EXPERIMENTAL DEVICE CAPABLE OF VERIFYING THE KEY ASPECTS OF THIS NOVEL SOURCE CONCEPT, AS WELL AS A THEORETICAL FRAMEWORK FOR INTERPRETING THE EMPIRICAL PHASE II RESULTS PRODUCED BY THE EXPERIMENTAL DEVICE AND EXTRAPOLATING THOSE RESULTS TO EVALUATE THE SUITABILITY OF THE PROPOSED SOURCE TO MEET THE REQUIREMENTS OF VARIOUS HIGH POWER MICROWAVE AND MILLIMETER WAVE DEFENSE AND INDUSTRIAL APPLICATIONS.

APPLIED RESEARCH ASSOCS INC
4300 SAN MATEO BLVD NE - STE A220
ALBUQUERQUE, NM 87110
CONTRACT NUMBER:
FRANK A MAESTAS
TITLE:
PARAMETRIC ANALYSIS OF EXPLOSIVE EFFECTIVENESS
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23252

SUBMITTED BY

A METHOD FOR THE EVALUATION AND OPTIMIZATION OF EXPLOSIVE MATERIAL CHARACTERIZATION IS PROPOSED. DAMAGE OF A RIGID RUNWAY CONCRETE SLAB WILL BE OPTIMIZED FOR VARIOUS EXPLOSIVE ENERGY RELEASE RATES. THE STEPS FOR THE PROGRAM ARE: 1) COLLECTION AND EVALUATION OF RUNWAY TEST DAMAGE RESULTS, 2) PRELIMINARY LITERATURE SEARCH FOR APPROPRIATE HYPERGOLIC ENERGY RELEASE RATE, 3) NUMERICAL SIMULATION OF EXPLOSIVES PLACED BELOW A RUNWAY IN AN ATTEMPT TO REPRODUCE THE TEST DATA, 4) NUMERICAL SIMULATION OF VARIOUS EXPLOSIVES RELEASE CHARACTERISTICS, AND 5) COMPARISONS OF THE RESULTS OF THE SECOND AND THIRD STEPS TO OPTIMIZE DAMAGE STATES.

APPLIED RESEARCH ASSOCS INC
4300 SAN MATEO BLVD NE - STE B380
ALBUQUERQUE, NM 87110
CONTRACT NUMBER:
HARRY BEWLEY
TITLE:
DEVELOPMENT OF FREE FIELD TIME OF ARRIVAL (TOA) GAGES FOR LOW OVERPRESSURE
TOPIC# 187 OFFICE: AFWL IDENT#: 27142

STANDARD TOADS CRYSTALS DO NOT PERFORM CONSISTENTLY AT LOW OVERPRESSURES DUE IN PART TO LOW SIGNAL OUTPUT OF THE PZT CRYSTAL AND ALSO DUE TO ELECTRICAL CROSSTALK. WE PROPOSE TO INVESTIGATE TWO TOA TRANSDUCER TYPES THAT ARE PROVEN CONCEPTS IN OTHER APPLICATIONS. WE WILL DESIGN TECHNICIAN FRIENDLY INTERFACES FOR THESE MEASUREMENT SYSTEMS. THE PHASE I DESIGN WILL INTERFACE WITH STANDARD TOADS III RECORDERS. RECOMMENDATIONS WILL BE MADE FOR A NEW TECHNOLOGY RECORDER FOR PHASE II. PARTICULAR ATTENTION WILL BE GIVEN TO HIGH SIGNAL OUTPUT SYSTEMS AND NOISE FREE METHODS OF DATA TRANSMISSION.

APPLIED TECHNOLOGY ASSOCS
PO BOX 149434
ORLANDO, FL 32814
CONTRACT NUMBER:
DR ROBERT CAVALLERI
TITLE:
ACTIVELY COOLED DECOY NOSETIPS
TOPIC# 217 OFFICE: BMO/MYSC IDENT#: 28636

SUBMITTED BY

COOLING CONCEPTS FOR RE-ENTRY VEHICLE NOSE TIPS EMPLOY EITHER PASSIVE ABLATIVE TECHNIQUES OR ACTIVE COOLING TECHNIQUES. ABLATIVE TECHNIQUES CAUSE FOREIGN GAS SPECIES FROM THE ABLATION PROCESS TO BE PRESENT IN THE AMBIENT AIR AND EFFECT THE AERODYNAMIC PERFORMANCE OF THE VEHICLE. THE ACTIVE COOLING TECHNIQUES CONSIST OF EITHER A GAS JET NOSE TIP (GJNT) OR A TRANSPIRATION COOLED NOSE TIP (TCNT). THE ACTIVE TECHNIQUES ARE EFFECTIVE IN MAINTAINING THE NOSE TIP CONFIGURATION. AS A RESULT, ACTIVE COOLING TECHNIQUES AND CONCEPTS ARE MORE DESIRABLE THAN ABLATIVE TECHNIQUES. THE ACTIVELY COOLED TECHNIQUES TO DECOYS REQUIRES FABRICATION OF ACTIVELY COOLED NOSE TIPS TO SMALLER SCALE CONFIGURATIONS. THIS CREATES A NEED TO SYSTEMATICALLY INVESTIGATE ACTIVE COOLING CONCEPTS FOR APPLICATION TO THE SELECTED MISSION. A CONCERN OF PRIMARY IMPORTANCE IS HOW EXISTING MANUFACTURING TECHNOLOGY AND MATERIALS TECHNOLOGY CAN BE EXTENDED TO THE MORE SEVERE HEATING LOADS OF DECOYS IN A TIMELY AND COST EFFECTIVE MANNER. THE EFFORT PROPOSED WILL APPLY ACTIVE COOLING DESIGN TECHNIQUES TO DECOYS TO DETERMINE THE MOST FAVORABLE CONCEPT (GJNT OR TCNT). THE RESULTS OF THE DESIGN ANALYSIS WILL THEN BE EMPLOYED TO DETERMINE THE MANUFACTURING APPROACH. CRITICAL FABRICATION STEPS WILL BE DEFINED AND DEMONSTRATED.

AQUANAUTICS CORP
4560 HORTON ST
EMERYVILLE, CA 94608
CONTRACT NUMBER:
DR EMORY De CASTRO
TITLE:
A RELIABILE MAINTENANCE-FREE OXYGEN SENSOR FOR AIRCRAFT USING AN OXYGEN-SENSITIVE COATING ON POETENTIOMETRIC ELECTRODES
TOPIC# 66 OFFICE: SAM/HSD IDENT#: 26880

CURRENT OXYGEN SENSORS ARE NEITHER RELIABLE NOR MAINTENANCE-FREE. THE MEASUREMENT OFTEN CONSUMES OXYGEN WHICH RESULTS IN PROBE FAILURE. THEY REQUIRE PERIODIC RECALIBRATION AND ARE FREQUENTLY REPLACED. A PASSIVE, NON-CONSUMING SENSOR IS POSSIBLE BY COMBINING AN OXYGEN-SENSITIVE COATING WITH A COMMON POTENTIOMETRIC ELECTRODE. THIS SENSOR IS EXPECTED TO BE COMPACT, ACCURATE, INSENSITIVE TO THE OBOGS OPERATING ENVIRONMENT AND REQUIRE LOW POWER. SINCE 1985, THE DEPART-

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MENT OF DEFENSE HAS CONTRACTED WITH AQUANAUTICS CORPORATION TO DEVELOP AN ARTIFICIAL GILL TECHNOLOGY. THIS PROGRAM PRODUCES OXYGEN-SENSITIVE COMPOUNDS THAT CAN BE COATED ON A FILM AND INCORPORATED IN A POTENTIOMETRIC PROBE. FOR PHASE I, AQUANAUTICS PROPOSES TO IDENTIFY THE BEST COMPOUNDS AND TEST THEM WITH LABORATORY SENSORS. THE AIR FORCE CAN APPLY THIS REVOLUTIONARY TECHNOLOGY WITH ONLY AN INCREMENTAL INVESTMENT BECAUSE AQUANAUTICS HAS INVESTED $7 MILLION IN R&D. AQUANAUTICS HAS DEMONSTRATED DRAMATIC TECHNICAL ADVANCEMENTS WITH A TEAM OF TWENTY PROFESSIONALS, OF WHOM TEN HOLD Ph.D DEGREES. THE COMPANY HAS SBIR EXPERIENCE AND THE FACILITIES TO CONDUCT THE SCOPE OF WORK. A SUB-CONTRACT WILL BE GIVEN TO DR. MARK MEYERHOFF AT THE UNIVERSITY OF MICHIGAN, WHO HAS SUBSTANTIAL EXPERIENCE WITH DEVELOPING NEW GAS SENSOR TECHNOLOGY.

ARD CORP
5457 TWIN KNOLLS RD
COLUMBIA, MD 21045
CONTRACT NUMBER:
DR RICHARD L HORST
TITLE:
UNOBTRUSIVE REAL-TIME MONITORING OF PILOT MENTAL STATUS:
DEVELOPMENT OF A TEST-BED SYSTEM
TOPIC# 65 OFFICE: AAMRL/HSD IDENT#: 26878

THE REAL-TIME DETERMINATION OF PILOT MENTAL STATUS IS A CRITICAL FEATURE OF THE WORKLOAD MONITORING AND MINDWARE SUBSYSTEMS THAT HAVE BEEN ENVISIONED FOR FUTURE FIGHTER AIRCRAFT, INCLUDING THE VIRTUAL-WORLD SUPER-COCKPIT. RECENT LABORATORY AND SIMULATOR STUDIES, SOME CONDUCTED BY ARD, HAVE SUGGESTED THE VALUE OF VARIOUS BEHAVIORAL AND PHYSIOLOGICAL INDICES FOR REFLECTING OPERATIONALLY RELEVANT MENTAL STATES. MOREOVER, THESE INDICES CAN BE OBTAINED UNOBTRUSIVELY WITHOUT BURDENING THE PILOT WITH CONTRIVED SECONDARY TASKS OR SUBJECTIVE RATINGS. THE PROPOSED EFFORT INVOLVES THE DEVELOPMENT OF REAL-TIME DATA PROCESSING ALGORITHMS FOR CHARACTERIZING MEASURES OF HEART-RATE VARIABILITY, EYE BLINKS, AND SINGLE-TRIAL, SCALP-RECORDED EVENT-RELATED POTENTIALS AND THE DEVELOPMENT OF A LABORATORY-BASED TEST-BED FOR IMPLEMENTING THESE ALGORITHMS USING A DISTRIBUTED PROCESSING CONFIGURATION. DECISION RULES THAT ARE PREDICTIVE OR REFLECTIVE OF TASK-DRIVEN FLUCTUATIONS IN OPERATOR PERFORMANCE WILL BE CALCULATED,

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BASED ON THE DERIVED BEHAVIORAL AND PHYSIOLOGICAL MEASURES, FROM DATA OBTAINED IN AN INITIAL "TRAINING" SESSION AND APPLIED TO CLASSIFY DATA COLLECTED FROM THE SAME SUBJECTS DURING A SUBSEQUENT "TEST" SESSION.

ARIAS RESEARCH ASSOCS INC
9241 CORD AVE
DOWNEY, CA 90240
CONTRACT NUMBER:
J L ARIAS
TITLE:
AERODYNAMICALLY-ACTIVATED JAMMER BATTERY
TOPIC# 193 OFFICE: BMO/MYSC IDENT#: 28604

THE FEASIBILITY OF USING AERODYNAMIC HEATING LOADS ON THE HPJ JAMMER BODY TO ACTIVATE A HIGH POWER MINIATURE BATTERY WILL BE INVESTIGATED. A MOLTEN ELECTROLYTE BATTERY OF NOVEL DESIGN APPEARS CAPABLE OF ACHIEVING MORE THAN TWICE THE VOLUMETRIC POWER DENSITY REQUIRED BY THE JAMMER AND ROUGHLY 50 TO 100 TIMES THE POWER DENSITY OF SMALL LITHIUM LIQUID-ELECTROLYTE CELLS. AUTOMATIC BATTERY ACTIVATION AND ELECTRICAL PERFORMANCE IN THE 350 KFT TO 50 KFT JAMMER LAUNCH REGIME WILL BE STUDIED AND A PRELIMINARY BATTERY DESIGN DEVELOPED.

ARIAS RESEARCH ASSOCS INC
9241 CORD AVE
DOWNEY, CA 90240
CONTRACT NUMBER:
DR C V DESHPANDEY
TITLE:
HIGH SPEED VAPOR DEPOSITION
TOPIC# 205 OFFICE: BMO/MYSC IDENT#: 28617

HIGH-SPEED METHODS OF PRODUCING 2 TO 10 MICRON ALUMINUM COATINGS ON 2000-FOOT LENGTHS OF .001-INCH DIAMETER GLASS FIBERS WILL BE STUDIED TO DEVELOP AN ECONOMICAL PROCESS/EQUIPMENT DESIGN.

ARKLINE RESEARCH
1020 ROBWILL PASS
CHERRY HILL, NJ 08034
CONTRACT NUMBER:
YVETTEM KLINE
TITLE:
AN INVESTIGATION OF NEW METHODS TO GENERATE AN ANTHROPOMETRIC DATABASE AND TO RESOLVE GARB FIT PROBLEMS
TOPIC# 138 OFFICE: AFWAL/ASD IDENT#: 26983

SUBMITTED BY

THE PURPOSE OF THE EFFORT PROPOSED HEREIN IS TO DEFINE THE PROCEDURES TO ESTABLISH AN ANTHROPOMETRIC DATABASE WHICH CAN BE ADDED TO ON A CONTINUOUS BASIS, AND WHICH WILL PROVIDE THE INFORMATION NEEDED BY VARIOUS USERS IN ORDER TO GUARANTEE THE FIT OF GARB WORN BY MILITARY PERSONNEL. TO MEET THAT END, SPECIFIC FIT PROBLEMS WILL BE STUDIED IN ORDER TO DETERMINE THEIR CAUSE. BY EXPERIENCED AND SPECIALIZED OBSERVATION, THE PROBLEMS WILL BE IDENTIFIED AS DESIGN, ISSUE OR USE RELATED, AND RECOMMENDATIONS WILL BE MADE AND TESTED. THOSE RECOMMENDATIONS WHICH DEMONSTRATE A STATISTICALLY SIGNIFICANT LINK BETWEEN GARB FIT AND SPECIFIC ANTHROPOMETRIC DIMENSIONS WILL BE FACTORED INTO THE DATABASE. A SYSTEMS TRADE OFF STUDY WILL BE CONDUCTED TO DETERMINE THE FEASIBILITY OF AUTOMATING THE MEASURING PROCESS. THE AUTOMATED PROCESS WOULD PROVIDE THE CAPABILITY TO STORE IMAGES, AS WELL AS SPECIFIC MEASUREMENTS. BY APPLYING DIFFERENT PROCESSING ALGORITHMS NEW INFORMATION CAN BE EXTRACTED FROM THE IMAGES TO MEET THE NEEDS OF THE MANY USERS INVOLVED IN THE LIFE CYCLE OF MILITARY GARB.

ASTRON CORP
470 SPRING PARK PL - STE 100
HERNDON, VA 22070
CONTRACT NUMBER:
JOSEPH R JAHODA
TITLE:
AIRCRAFT ANTENNA SYSTEM--ADVANCED TECHNOLOGY - LIFE CYCLE COST CONSIDERATIONS
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 26994

THE AVAILABILITY OF NEW ADVANCED TECHNOLOGY AND MATERIALS MAKES POSSIBLE GREATLY SIMPLIFIED, LOWER COST AND MORE RELIABLE AIRCRAFT ANTENNA SYSTEMS. AS AN EXAMPLE, THE ELIMINATION OF THE HF HIGH POWER COUPLER FROM THE PRESENT HF TRANSMITTING SYSTEM CAN RESULT IN MILLIONS OF DOLLARS IN SAVINGS FOR INITIAL ACQUISITION AND INSTALLATION COSTS. IT CAN ALSO RESULT IN ORDERS OF MAGNITUDE GREATER SAVINGS FOR THE LONG TERM LIFE CYCLE COSTS. EACH OF THE AIRCRAFT ANTENNA SYSTEMS WILL BE CONSIDERED FOR THE USE OF ADVANCED TECHNOLOGY IN ORDER TO PROVIDE SIMILAR SAVINGS.

ASTRON CORP
470 SPRING PARK PL - STE 100
HERNDON, VA 22070
CONTRACT NUMBER:
JOSEPH R JAHODA
TITLE:
CONFORMAL AIRCRAFT HF TRANSMITTING ANTENNA
TOPIC# 30 OFFICE: ESD/XRB IDENT#: 28541

SUBMITTED BY

PRESENT HF AIRCRAFT COMMUNICATIONS ARE BURDENED WITH INEFFICIENT, NARROW BANDWIDTH, SLOWLY TUNED HIGH POWER COUPLERS. THE ASTRON PROPOSED AIRCRAFT ANTENNA SYSTEM IS AN EASILY ADDED, CONFORMAL ANTENNA WHICH OBVIATES THE ABOVE DISADVANTAGES BY ELIMINATING THE COUPLER. FURTHER, IT LENDS ITSELF TO USING 2 SUCH ANTENNAS WHICH CAN OPERATE IN A TRANSMIT/TRANSMIT AND TRANSMIT/RECEIVER SIMULTANEOUS OPERATION (SIMOP) MODE. THE ANTENNA DESIGN ASSURES MINIMUM COUPLING BETWEEN THESE TWO ANTENNAS DUE TO THEIR INHERENTLY LOW IMPEDANCE ACROSS THE ENTIRE FREQUENCY RANGE OF 2 TO 30 MHz. VERY SIGNIFICANT IMPROVEMENTS IN RELIABILITY AND MAINTAINABILITY WILL RESULT AS WELL AS A LARGE REDUCTION IN LIFE CYCLE COST DUE TO THE ELIMINATION OF THE ANTENNA HIGH POWER COUPLER.

ASTRON CORP
470 SPRING PARK PL - STE 100
HERNDON, VA 22070
CONTRACT NUMBER:
JOSEPH R JAHODA
TITLE:
COMMUNICATIONS THROUGH INTERVENING MEDIA
TOPIC# 209 OFFICE: BMO/MYSC IDENT#: 28623

THE ASTRON PROPOSED UNDERGROUND COMMUNICATIONS SYSTEM UTILIZES AN INNOVATIVEPHASE MODULATED RF TRANSMISSION WHOSE MODULATION RATE IS ADJUSTED TO PROVIDE DECREASED TRANSMISSION LOSSES THROUGH SOIL/ROCK ENVIRONMENT AS COMPARED TO CONVENTIONAL RF COMMUNICATION SYSTEMS. ADDITIONAL MAJOR ADVANTAGES ARE: a. DECREASE TRANSMISSION LOSSES THROUGH OTHER MEDIA (IF DESIRED); b. INCREASED DATA RATE ABOVE THE USUAL AM OR FM CAPABILITIES, AND c. SECURE COMMUNICATIONS.

ASTRON RESEARCH & ENGINEERING
130 KIFER CT
SUNNYVALE, CA 94086
CONTRACT NUMBER:
TAKASHI NAKAMURA
TITLE:
DEMONSTRATION OF THE OBLIQUE DETONATION WAVE FOR HYPERSONIC PROPULSION
TOPIC# 233 OFFICE: AFOSR/NA IDENT#: 28646

SUBMITTED BY

THE OBLIQUE DETONATION WAVE ENGINE (ODWE) IS A CANDIDATE ALTERNATIVE TO THE SUPERSONIC COMBUSTION RAMJET (SCRAMJET) FOR HYPERSONIC AEROPROPULSION. THE POTENTIAL ADVANTAGES OF THE ODWE OVER THE SCRAMJET INCLUDE: LOWER DIFFUSER TEMPERATURES AND PRESSURES, WITH CORRESPONDINGLY LOWER FLOW DECELERATION LOSSES; RELATIVELY UNIFORM STEADY COMBUSTION WITHIN A SMALLER LENGTH AND VOLUME; AND LESSER COOLING REQUIREMENTS. IN SPITE OF THESE POTENTIAL ADVANTAGES, THERE HAS TO DATE BEEN NO EXPERIMENT DEMONSTRATING THE STABILITY OF AN OBLIQUE DETONATION WAVE (ODW). THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO OBTAIN DATA ON THE STABILITY OF THE ODW, AND TO ASSESS THE APPLICABILITY OF THE ODW TO HYPERSONIC PROPULSION. THE PROPOSED PROGRAM CONSISTS OF COMPUTATIONAL FLUID DYNAMIC (CFD) ANALYSES OF THE ODW FOLLOWED BY AN EXPERIMENTAL INVESTIGATION OF THE SUSTAINED, STABLE ODW IN A CONFIGURATION SIMILAR TO THE "RAM CANNON," IN WHICH A PROJECTILE IS FIRED INTO A TUBE FILLED WITH A COMBUSTIBLE GAS MIXTURE. TO OBTAIN A HIGH ENOUGH INITIAL VELOCITY TO INITIATE THE ODW, THE PROJECTILE WILL BE ACCELERATED BY THE "WAVE GUN," A TWO-STAGE HYPERVELOCITY LIGHT GAS GUN, TO VELOCITIES GREATER THAN 2 KM/SEC. THE RESULTING FLOW CONDITIONS WILL PRODUCE THE ODW, AS DISTINCT FROM THE THERMALLY CHOKED SUBSONIC COMBUSTION EXPERIENCED IN "RAM CANNON" TESTING TO DATE.

ASTRONN RESEARCH & ENGINEERING
130 KIFER CT
SUNNYVALE, CA 94086
CONTRACT NUMBER:
T CRAIG DERBIDGE
TITLE:
EML BORE DIAGNOSTICS
TOPIC# 4 OFFICE: AD/PMR IDENT#: 23315

ACHIEVING THE HYPERVELOCITY POTENTIAL OF ELECTROMAGNETIC RAILGUNS IS IMPAIRED BY ABLATION OF BORE MATERIALS AND A LACK OF WELL VALIDATED UNDERSTANDING OF PLASMA ARMATURE PERFORMANCE. DEVELOPMENT OF BORE MATERIALS AND MODELING OF PLASMA ARMATURES IS HAMPERED BY THE LACK OF DIAGNOSTICS WHICH CAN ACCURATELY MEASURE THE IN-BORE ENVIRONMENT. A KEY DIAGNOSTIC WHICH WOULD BE EXTREMELY USEFUL FOR BOTH MATERIAL DEVELOPMENT AND PLASMA UNDERSTANDING IS DIRECT MEASUREMENT

SUBMITTED BY

OF THE VERY HIGH HEAT FLUX TO THE BORE SURFACE. THIS PHASE I PROGRAM WILL DEMONSTRATE A BORE HEAT FLUX GAGE THROUGH PROOF-OF-CONCEPT TESTS IN AN ACTUAL EML. OUR ANALYSIS INDICATES THAT ACCURATE BORE HEAT FLUX MEASUREMENTS CAN BE ACCOMPLISHED BY USING A SMALL SLUG CALORIMETER CONSTRUCTED OF ADVANCED HIGH TEMPERATURE MATERIALS (WE ARE CONSIDERING EITHER PYROLITIC GRAPHITE OR THIN FILM DIAMOND COATING). THE GAGE WILL BE PLACE IN ONE OF THE BARREL INSULATORS TO ELIMINATE OHMIC HEATING ISSUES. WE WILL COMPLETE DETAILED DESIGN OF THE GAGE USING A TRANSIENT HEAT TRANSFER COMPUTER PROGRAM DEVELOPED FOR THE BORE ENVIRONMENT. WE WILL FABRICATE A PROTOTYPE GAGE AND TEST IN A SUITABLE RAILGUN, PREFERRABLY THE EGLIN AFB PUG FACILITY.

ASTROTECH INC
2245 NELSON DR
SCHENECTADY, NY 12309
CONTRACT NUMBER:
KI BUI MA
TITLE:
READ/WRITE/ERASE OPTICAL MATERIALS
TOPIC# 50 OFFICE: RADC/XPX IDENT#: 28577

WE PROPOSE TO INVESTIGATE INTO THE PRODUCTION OF HIGH PERFORMANCE REVERSIBLE OPTICAL DISK, USING THIN FILMS OF AN ALLOY OF NEODYMIUM, DYSPROSIUM AND IRON AS THE RECORDING MATERIALS. THE REVERSIBLE OPTICAL DISKS WOULD HAVE A C/N RATIO OF 55 dB AT 2 MHz., A CYCLE LIFETIME OF MORE THAN A MILLION, AND A RETENTION TIME OF 10 TO 20 YEARS.

ASTROX CORP (FORMERLY: NU TECH)
3500 MARLBROUGH WY
COLLEGE PARK, MD 20740
CONTRACT NUMBER:
DR AJAY P KOTHARI
TITLE:
RAREFIELD GAS FLOW EFFECTS ON HYPERSONIC VEHICLES
TOPIC# 103 OFFICE: AFWAL/ASD IDENT#: 26930

BASED UPON A PRELIMINARY LITERATURE SEARCH, SEVERAL POSSIBLE AREAS

SUBMITTED BY

FOR FUTURE RESEARCH WERE IDENTIFIED. FIRST, THERE APPEARS TO BE NO PUBLISHED IDENTIFICATION OF THE RAREFIELD FLOW REGIMES, AND CRUCIAL RAREFIELD FLIGHT REGIMES, FOR VARIOUS VEHICLES IN DESIRED HIGH ALTITUDE MANEUVERS. SECOND, IT SEEMS CLEAR THAT CONTINUUM ANALYSES HAVE SHORTCOMINGS IN CERTAIN FLIGHT REGIMES AND RAREFIELD FLOW ANALYSES, SUCH AS MONTE CARLO SIMULATIONS, ARE NECESSARY BUT NO ATTEMPT IN EVIDENCE TO PROVIDE A MATCHING PROCESS BRINGING COMPUTATIONS FOR CONTINUUM AND RAREFIELD REGIONS TOGETHER. THIRD, MONTE CARLO SIMULATION SEEM TO BE CABLE OF COMPUTING PROPERTIES IN RAREFIELD FLOW REGIONS WITH A WIDE RANGE OF FEATURES, SUCH AS CHEMICAL REACTIONS, WITHOUT MAJOR MODIFICATIONS. HOWEVER, BIRD (1985) STATES THAT THE NECESSARY DATABASE IS DEFICIENT. THIS PROPOSAL SUGGESTS ADDITIONAL LITERATURE SEARCHES IN MOST OF THESE AREAS. IN ADDITION, IT IS PROPOSED TO INITIATE FORMULATION OF A METHOD OF MATCHED ASYMPTOTIC EXPANSIONS TO DEVELOP A MATCHING PROCEDURE TO UNIFY THE COMPUTATION OF RAREFIELD AND CONTINUUM FLOW REGIONS. FURTHER SUGGESTIONS WERE MADE FOR RAREFIELD AND CONTINUUM FLOW ANALYSES OF SHOCK STRUCTURE AND FOR EXTENSIONS TO THE CAPABILITY OF MONTE CARLO SIMULATIONS.

ATLANTIC AEROSPACE ELECTRONICS CORP
6404 IVY LN - STE 300
GREENBELT, MD 20770
CONTRACT NUMBER:
RICHARD FERRANTE
TITLE:
THE USE OF NEURAL NETWORKS FOR TARGET IDENTIFICATION
TOPIC# 52 OFFICE: RADC/XPX IDENT#: 28579

A RECENT SURVEY OF NEURAL NETWORK TECHNOLOGY BY ATLANTIC AEROSPACE PERSONNEL HAS IDENTIFIED THE NECESSITY OF USING A NUMBER OF NETWORK LAYERS TO ADDRESS TYPICAL PROBLEMS IN TARGET IDENTIFICATION. IN ADDITION TO UPDATING THIS SURVEY, THIS EFFORT WILL DEVELOP AND DEMONSTRATE A NEURAL NETWORK APPROACH TO TARGET RECOGNITION BASED ON A NEW CLASS OF DISTRIBUTED, ITERATIVE IMAGE OPERATORS MODELED AFTER THE PHYSIOLOGY OF HUMAN VISION, WHICH WILL COMBINE PORTIONS OF THE LOW AND MEDIUM LEVEL VISION TASKS INTO A SINGLE INTEGRAL NETWORK. THE GOAL FOR THIS RESEARCH IS TO DEVELOP AND EVALUATE A NEURAL NETWORK PARADIGM BY WHICH AN INITIAL SET OF SINGULARITIES IN THE VISUAL FIELD (JETS) DERIVED DIRECTLY FROM THE IMAGE DATA, IS REFINED

SUBMITTED BY

TO BEST MATCH PRESCRIBED VISUAL AND GEOMETRIC CONSTRAINTS, VIA AN ITERATIVE NETWORK RELAXATION TECHNIQUE. THIS OPERATION WILL HAVE THE EFFECT OF EXTRACTING VISUALLY SIGNIFICANT FEATURES FROM IMAGERY AND INHERENTLY GROUPING THEM IN A MANNER NORMALLY ACHIEVED BY POST PROCESSING TECHNIQUES. WE BELIEVE THAT THIS APPROACH IS UNIQUE AND ADDRESSES A PRIMARY NEED IN THE APPLICATION OF NEURAL NETWORK TECHNOLOGY TO IMAGE ANALYSIS IDENTIFIED IN OUR PREVIOUS SURVEY, I.E., THE SELECTION OF APPROPRIATE IMAGE FEATURES TO SUPPORT TE-COGNITION OBJECTIVES. WHILE THE PROPOSED TECHNIQUE IS EXPECTED TO RESULT IN FEWER NETWORK LAYERS FOR LOW AND MEDIUM LEVEL VISION TASKS, IT WILL STILL BE NECESSARY TO PROVIDE ADDITIONAL PROCESSING TO SUPPORT HIGHER LEVEL FUNCTIONS SUCH AS TARGET IDENTIFICATION. ACCORDINGLY, THE UPDATED NEURAL NETWORK SURVEY WILL SPECIALLY EMPHASIZE THOSE NETWORK PARADIGMS THAT ARE APPROPRIATE TO HIGH LEVEL VISION PROCESSING TASKS.

ATMOSPHERIC & ENVIRONMENTAL RSCH INC
840 MEMORIAL DR
CAMBRIDGE, MA 02139
CONTRACT NUMBER: F49620-88-C-0105
DR ROSS N HOFFMAN
TITLE:
ON THE USE OF MULTIPROCESSING COMPUTERS FOR GLOBAL NUMERICAL WEATHER PREDICTION
TOPIC# 235 OFFICE: AFOSR/NC IDENT#: 28650

WE PROPOSE THE DEVELOPMENT OF GLOBAL SPECTRAL NUMERICAL WEATHER PREDICTION (NWP) MODELS SPECIALLY DESIGNED TO TAKE ADVANTAGE OF MULTIPROCESSING COMPUTERS. SEVERAL CANDIDATE ALGORITHMS WILL BE DESIGNED AND ANALYZED. THE BEST DESIGNS WILL BE CODED AND TESTED IN A SIMULATED MULTIPROCESSOR. THIS STUDY IS IMPORTANT BECAUSE OPERATIONAL NWP IS TIME CONSTRAINED AND LIMITED BY AVAILABLE COM-PUTING POWER. FURTHER ADVANCES IN NWP REQUIRE EFFICIENT USE OF MULTIPROCESSORS. THE RESULTS OF THIS STUDY SHOULD ALSO AID ALL ATMOSPHERIC RESEARCHERS WHO USE GLOBAL SCALE MODELS. OUR APPROACH WILL INCLUDE CONSIDERATION OF DIFFERENT POSSIBLE MULTIPROCESSOR DESIGNS.

ATSS INC
606 E MILL ST - STE 2044
SAN BERNARDINO, CA 92408
CONTRACT NUMBER:
HENRY L MOODY
TITLE:
HYGROSCOPIC EFFECTS ON REENTRY VEHICLE ANTENNA WINDOWS
TOPIC# 211 OFFICE: BMO/MYSC IDENT#: 28627

SUBMITTED BY

ADVANCED-HIGH ACCURACY AIR FORCE REENTRY SYSTEMS CAN INVOLVE THE USE OF ELECTRICALLY STEERABLE ANTENNAS TO CONDUCT GUIDANCE, SURVEILLANCE AND ACQUISITION FUNCTIONS. TO ACHIEVE THE ACCURARY NECESSARY FOR THESE SYSTEM, LABORATORY TUNING AT SIMULATED OPERATIONAL CONDITIONS IS REQUIRED TO PREVENT ERRORS INDUCED BY FABRICATION TOLERANCES. ESSENTIALLY ALL WINDOW MATERIAL CANDIDATES FOR AIR FORCE SYSTEMS ARE HYGROSCOPIC TO VARYING DEGREES. VARIABILITY IN WATER CONTENT CAN CHANGE THE MATERIALS' DIELECTRIC PROPERTIES AND THUS DEGRADE LABORATORY TUNING AND ANTENNA PERFORMANCE. THE PROPOSED EFFORT IS TO ASSESS THE NEED TO CONTROL ANTENNA WINDOW HYGROSCOPIC BEHAVIOR, AND IDENTIFY CANDIDATE METHODS TO REDUCE HYGROSCOPIC SENSITIVITY.

ATSS INC
606 E MILL ST - STE 2044
SAN BERNARDINO, CA 92408
CONTRACT NUMBER:
HENRY L MOODY
TITLE:
REENTRY VEHICLE WINDOW SYSTEM DESIGN
TOPIC# 212 OFFICE: BMO/MYSC IDENT#: 28628

THE DEFICIENCIES IN CURRENT ANTENNA WINDOW MATERIALS AND DESIGN METHODS RESTRICT THE PERFORMANCE GOALS OF CERTAIN ADVANCED AIR FORCE SYSTEMS. TO IMPROVE THE PERFORMANCE AND/OR EXPERIMENTAL EVALUATION OF ANTENNA WINDOWS AND THEREFORE IMPROVE OVERALL SYSTEM EFFECTIVENESS; MATERIAL FORMULATIONS, MATERIAL CONSTRUCTIONS, DESIGN METHODS AND TEST FACILITY IMPROVEMENTS WILL BE EVALUATED. THIS STUDY WILL INTEGRATE THE ONGOING EFFORTS OF MATERIAL AND TEST FACILITY DEVELOPERS WITH SYSTEM DESIGN INVESTIGATIONS TO ENSURE THAT: 1) MATERIAL AND TEST FACILITY RESEARCH IS RELEVANT TO SYSTEM REQUIREMENTS AND DESIGN FEATURES, AND 2) SYSTEM DESIGNERS ARE AWARE OF EMERGING MATERIALS AND TESTING TECHNOLOGIES.

ATSS INC
606 E MILL ST - STE 2044
SAN BERNARDINO, CA 92408
CONTRACT NUMBER:
HENRY L MOODY
TITLE:
TRANSPIRATION COOLED NOSETIP DESIGN TECHNIQUES
TOPIC# 215 OFFICE: BMO/MYSC IDENT#: 28633

SUBMITTED BY

TRANSPIRATION COOLED NOSETIPS (TCNTs) FOR ICBM REENTRY VEHICLES OFFER SHAPE STABILITY, ENHANCED THERMAL/EROSION PERFORMANCE AND POTENTIAL DESIGN SOLUTIONS FOR HIGH STRENGTH AND SMALL RADIUS NOSETIPS. CURRENT TCNT DESIGN AND FABRICATION PROCESSES ARE TIME-CONSUMING AND EXPENSIVE, HAMPERING RESEARCH EFFORTS AND INHIBITING APPLICATION OF TCNTs TO REENTRY SYSTEMS. ADVANCED DESIGN AND FABRICATION METHODS WILL BE INVESTIGATED IN THIS PROGRAM TO SOLVE THESE PROBLEMS. EMERGING CAD/CAM TECHNOLOGIES AND INNOVATIVE DESIGN CONCEPTS WILL BE EXPLOITED TO REDUCE DESIGN/FABRICATION TIME AND COSTS, AND INCREASE OVERALL SYSTEM RELIABILITY. KEY ELEMENTS OF THE PROPOSED INNOVATIVE TECHNOLOGIES WILL BE VERIFIED THROUGH SUBSCALE FABRICATION AND TEST.

AV DYNAMICS INC
825 MYRTLE AVE
MONROVIA, CA 91016
CONTRACT NUMBER:
DR P B S LISSAMAN
TITLE:
LIGHT WEIGHT TACTICAL TOWER
TOPIC# 41 OFFICE: RADC/XPX IDENT#: 28567

THERE IS A MILITARY REQUIREMENT FOR LIGHTWEIGHT RAPID DEPLOYABLE, EASILY TRANSPORTABLE, AND RUGGED UNGUYED TOWERS FOR C3 SYSTEMS. FOR LOS MM RADIO SYSTEMS, WIND INDUCED ANGULAR DEFLECTIONS AT THE TOP ARE SEVERELY RESTRICTED BY PRECISION SIGHTING REQUIREMENTS. A FUNDAMENTAL ANALYSIS OF STRESS REQUIREMENTS INDICATES THAT WEIGHT IS PROPORTIONAL TO MATERIAL DENSITY AND THE FOURTH POWER OF THE HEIGHT, AND INVERSELY PROPORTIONAL TO MATERIAL ELASTIC MODULUS AND CROSS SECTION WIDTH. THIS INDICATES THAT GRAPHITE IS THE OPTIMAL MATERIAL AND THAT STABILIZATION OF THIN WALL STRUCTURE AND REDUCTION OF TOWER WIND DRAG ARE CRITICAL ITEMS. A LIGHTWEIGHT UNGUYED COMPOSITE TOWER OF LOW DRAG AND HIGH RIGIDITY IS PROPOSED. USING STABILIZED GRAPHITE COMPOSITE STRUCTURE, A 100 FT COLLAPSIBLE TOWER IN THE 200LB WEIGHT RANGE CAN BE FABRICATED. A NUMBER OF INNOVATIVE CROSS SECTIONS, STABILIZING TECHNIQUES AND FOLDING MECHANISMS ARE PROPOSED. THE FOUR TASKS ARE DEFINED TO BE 1) IDENTIFY DESIGN PARAMETERS, 2) PERFORM A CONFIGURATION TRADE-OFF STUDY, 3) A STRUCTURAL ANALYSIS, AND 4) DRAFT DETAILED MECHANICAL DESIGN DRAWINGS.

SUBMITTED BY

AVIATION RESEARCH ASSOCS/BROOKS & ASSOCS
4351 BRAUNTON RD
COLUMBUS, OH 43220
CONTRACT NUMBER:
N KENT BROOKS
TITLE:
COMPUTERIZED PILOT JUDGMENT TRAINING
TOPIC# 63 OFFICE: SAM/HSD IDENT#: 26869

THE OBJECTIVE OF THIS HUMAN SYSTEMS/SUBSYSTEMS RESEARCH PROJECT IS TO PREPARE A COMPUTERIZED PILOT JUDGMENT TRAINING METHODOLOGY BASED UPON THE COMPUTERIZED TESTING PROGRAM ESTABLISHED IN AN EARLIER SBIR PHASE I PROJECT. AN INTERACTIVE COMPUTERIZED TRAINING PROGRAM WILL BE PREPARED USING SITUATIONAL TECHNIQUES THAT HAVE BEEN PROVEN IN THE CLASSROOM. THE TRAINING PROGRAM WILL BE DESIGNED AROUND WHAT WE BELIEVE WE CAN MEASURE. THE ULTIMATE OBJECTIVE FOR THE PROGRAM IS A COMPUTER PROGRAM THAT BOTH ASSESSES AND TEACHES PILOT JUDGMENT.

BAKER W ENGINEERING
PO BOX 6477
SAN ANTONIO, TX 78209
CONTRACT NUMBER:
DR WILFRED E BAKER
TITLE:
REACTIVE PROTECTION FOR HARDENED FACILITIES
TOPIC# 58 OFFICE: AFESC/RDXP IDENT#: 23215

THREE CONCEPTS ARE PROPOSED FOR REACTIVE PROTECTIVE SYSTEMS FOR ABOVE-GROUND HARDENED STRUCTURES. THESE AND OTHER CONCEPTS WOULD BE EVALUATED FOR THEIR EFFECTIVENESS IN DEFEATING OR SERIOUSLY DEGRADING THE TERMINAL BALLISTIC PERFORMANCE OF A VARIETY OF CONVENTIONAL MUNITIONS WHICH COULD BE USED TO ATTACK AND DIRECTLY IMPACT HARDENED STRUCTURES. APPROXIMATE COST COMPARISONS WOULD BE MADE BETWEEN COMPETING CONCEPTS WHICH SHOW GOOD PROMISE. LIMITED "PROOF-OF-PRINCIPLE" TESTING OF ONE OR MORE CONCEPTS IS ALSO PLANNED IN THE PHASE I STUDY.

SUBMITTED BY

BELL CHEMICAL RESEARCH
4415 HASTINGS DR
BOULDER, CO 80303
CONTRACT NUMBER:
DR WILLIAM BELL
TITLE:
PHOTOCHEMICAL AIR SEPARATION
TOPIC# 134 OFFICE: AFWAL/ASD IDENT#: 26979

A NEED EXISTS FOR A PROCESS FOR SEPARATING OXYGEN FROM AIR WHICH IS HIGHLY SELECTIVE, RAPID, OR MINIMAL WEIGHT AND BULK, AND ENERGY EFFICIENT. WE PROPOSE TO INVESTIGATE A NOVEL SYSTEM IN WHICH OXYGEN IS SEPARATED FROM AIR BY A CYCLIC PROCESS; OXYGEN IS FIRST BOUND BY AN EXOTHERMIC REACTION AT A TRANSITION METAL SITE IN A CARRIER MOLECULE, AND LATER RELEASED BY A PHOTOCHEMICAL REACTION INDUCED BY IRRADIATING THE CARRIER MOLECULE. IN PHASE I OF THIS PROJECT WE WILL DEMONSTRATE THE FEASIBILITY OF THIS CONCEPT, IDENTIFY THE MOST EFFICIENT CARRIERS, AND DEFINE OPERATING PARAMETERS FOR A DEVICE USING THIS TECHNOLOGY. A PROTOTYPE DEVICE WILL BE CONSTRUCTED AND TESTED IN PHASE II.

BERKELEY APPLIED SCIENCE & ENGR/B.A.S.E.
PO BOX 10104
BERKELEY, CA 94709
CONTRACT NUMBER:
A R GANJI
TITLE:
AEROTHERMODYNAMIC ANALYSIS OF COMBINED CYCLE PROPULSION SYSTEMS
TOPIC# 136 OFFICE: AFWAL/ASD IDENT#: 26981

FUTURE ADVANCED AEROSPACE VEHICLES ARE EXPECTED TO BE FULLY REUSABLE, AUTONOMOUS, CAPABLE OF OPERATION IN SUBSONIC TO HYPERSONIC MACH RANGE OF 0 TO 8 AND ABOVE. THESE VEHICLES SHOULD NOT ONLY BE ABLE TO OPERATE IN FLEXIBLE MISSION PROFILES, BUT ALSO BE COST EFFECTIVE. COMBINED CYCLE PROPULSION TECHNOLOGY IS THE PRIME CANDIDATE AS THE PROPULSION SYSTEM FOR ACHIEVING THESE GOALS. AEROTHERMODYNAMIC

SUBMITTED BY

ANALYSIS OF VARIOUS COMBINED CYCLE PROPULSION CONCEPTS IS THE FIRST STEP TOWARD THE IDENTIFICATION, COMPARISON, AND SELECTION OF THESE NOVEL PROPULSION CONCEPTS FOR FURTHER R&D EFFORT. NUMERICAL SIMULATION OF THE AEROTHERMODYNAMIC PERFORMANCE OF NINE DIFFERENT CONFIGURATIONS OF COMBINED CYCLES WITH BASIC SUBSYSTEMS OF TUBOJET, TURBO FAN, RAMJET, ROCKET, AND AIR AUGMENTED ROCKET IS PROPOSED. THE RESULTS WILL INCLUDE THE AEROTHERMODYNAMIC PERFORMANE CURVES, IDENTIFICATION OF THE OPTIMUM OPERATIONAL MODE FOR EACH CONFIGURATION, AND THE EVALUATION OF THE PROPOSED CONFIGURATIONS IN TERMS OF THEIR AEROTHERMODYNAMIC PERFORMANCE. THE DEVELOPED COMPUTER PROGRAM WILL BE UTILIZED IN FURTHER COMPREHENSIVE SIMULATION OF THE SELECTED COMBINED CYCLE PROPULSION CONCEPT(S) IN PHASE II OF THE PROPOSED INVESTIGATION.

BERNIER & ASSOCS INC
458 BOSTON ST - STE 2
TOPSFIELD, MA 01983
CONTRACT NUMBER:
LEO J D BERNIER
TITLE:
MANUFACTURING SUPPORT/DECISION SUPPORT SYSTEM (MD/DSS)
TOPIC# 33 OFFICE: ESD/XRB IDENT#: 28600

THIS PROPOSAL PRESENTS AN APPROACH FOR ESTABLISHING THE FEASIBILITY OF A MANUFACTURING SUPPORT/DECISION SUPPORT SYSTEM. THE TECHNICAL CHALLENGE IS TO DETERMINE IF TYPICAL MANUFACTURING SUPPORT DECISION PROCESSES ARE SEMI-STRUCTURED AND IF THESE PROCESSES CAN BE PARTIALLY AUTOMATED IN THE FORM OF USER-FRIENDLY DECISION SUPPORT SYSTEMS. EXPERT SYSTEMS WILL ALSO BE EXPLORED AS A MEANS OF EXTENDING THE MORE TRADITIONAL NOTION OF DECISION SUPPORT INTO THE MANUFACTURING SUPPORT ARENA. PHASE I WILL ESTABLISH THE FEASIBILITY OF THE SYSTEM, IDENTIFY A SUBSET OF CANDIDATE DECISION MODULES, DEVELOP A SIMULATION OF THE SYSTEM, AND DEFINE A DESIGN STRATEGY. THE DESIGN STRATEGY WILL SERVE AS A "BLUEPRINT" FOR DEVELOPING A PROOF-OF-CONCEPT SOFTWARE SYSTEM.

BIOMAGNETIC TECHNOLOGIES INC
4174 SORRENTO VALLEY BLVD
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR MARK S DiIORIO
TITLE:
DEVELOPMENT OF A PRACTICAL HIGH TRANSITION TEMPERATURE SQUID
TOPIC# 117 OFFICE: AFWAL/ASD IDENT#: 26951

SUBMITTED BY

THE RECENT DISCOVERY A HIGH TRANSITION TEMPERATURE SUPERCONDUCTORS (Tc > OR - 95K) AND THEIR SUBSEQUENT PREPARATION IN THIN-FILM OPENS THE POSSIBILITY OF FABRICATING A PRACTICAL SUPERCONDUCTING QUANTUM INTERFERENCE DEVICE (SQUID) FROM THESE MATERIALS. SINCE THE SQUID IS THE MOST SENSITIVE DETECTOR OF MAGNETIC FLUX KNOWN, THERE ARE INNUMERABLE APPLICATIONS RANGING FROM MAGENTOENCEPHALOGRAPHY (MEG) TO MAGNETIC ANOMALY DETECTION. PRESENTLY, SQUIDS MUST BE COOLED TO 4 K IN ORDER TO OPERATE. USE OF THE NEW HIGH-Tc SUPERCONDUCTORS WOULD ALLOW OPERATION AT A WIDE VARIETY OF TEMPERATURES RANGING FROM ABOVE 77 K TO BELOW 10 K; THE TEMPERATURE OF OPERATION CAN BE SELECTED FOR OPTIMAL PERFORMANCE AND COOLING COST. THE KEY COMPONENT IN CONVENTIONAL SQUIDS IS A JOSEPHSON TUNNEL JUNCTION, WHICH WILL NOT BE EASY TO FABRICATE IN THE NEW PEROVSKITE SUPERCONDUCTORS DUE TO THEIR VERY SHORT SUPERCONDUCTING COHERENCE LENGTH AND THEIR PRESENT NEED FOR HIGH TEMPERATURE HEAT TREATMENT. WE PROPOSE TO OVERCOME THESE OBSTACLES BY DEVELOPING A DIFFERENT TYPE OF JOSEPHSON JUNCTION, NAMELY A SUPERCONDUCTOR-NORMAL METAL-SUPERCONDUCTOR (SNS) MICROBRIDGE. THE GOAL OF PHASE I IS TO DETERMINE THE FEASIBILITY OF MAKING A PRACTICAL HIGH-Tc SQUID USING SNS MICROBRIDGES, AND TO DETAIL A FABRICATION PROCESS TO BE IMPLEMENTED IN PHASE II.

BRAIDTECH INC
3 GREAT VALLEY PKWY - STE 105
MALVERN, PA 19355
CONTRACT NUMBER:
ROBERT A FLORENTINE
TITLE:
TURBINE ENGINE COMPOSITE PREFORMS: DESIGN OF A MAGNAWEAVE LOOM FOR 3-D BRAIDING NET SHAPE
TOPIC# 125 OFFICE: AFWAL/ASD IDENT#: 26965

BRAIDTECH'S PROPRIETARY AUTOMATED, CONTINUOUS PROCESS FOR FABRICATING 3-D BRAIDED COMPOSITE PREFORMS WILL BE THE BASIS FOR THE DESIGN OF A 3-D BRAIDING MACHINE CAPABLE OF FABRICATING NET SHAPE PREFORMS OF INTEREST TO THE TURBINE ENGINE AEROPROPULSION DESIGNER. THE DESIGN THAT EVOLVES WILL BE AN EXTENSION OF BASIC CONCEPTS EVALUATED BY BRAIDTECH FOR THE DESIGN OF AUTOMATED LOOMS FOR FABRICATING SHAPES FOR THE AIRCRAFT, MARINE, AND LAND TRANSPORTATION INDUSTRIES. THE

SUBMITTED BY

PROJECT WILL REVIEW SHAPES OF INTEREST, AND SELECT A SET OF CRITERIA THAT REFLECTS THOSE VAIOUS SHAPES, AND THE MECHANICAL REQUIREMENTS TO BE SATISFIED BY THE REINFORCING PREFORM. THREE DIMENSIONAL REINFORCEMENT IS ESSENTIAL; ACCURATE AND REPRODUCIBLE FIBER PLACEMENT HAVE EQUAL IMPORTANCE. A CONTINUOUS, MINIMUM LABOR, AUTOMATED, INEXPENSIVE PROCESS IS DESIRED; MAGNAWEAVE IS SEEN TO HAVE THE POTENTIAL TO SATISFY BOTH THE TECHNICAL AND THE ECONOMIC REQUIREMENTS OF THE PROGRAM.

BROOKHAVEN SCI-TECH ASSOCS INC
PO BOX 504
UPTON, NY 11973
CONTRACT NUMBER:
PIERRE GRAND
TITLE:
HIGH ENERGY ELECTRON BEAM SOURCE FOR IONOSPHERIC MODIFICATION EXPERIMENT
TOPIC# 177 OFFICE: AFGL IDENT#: 27125

THIS PHASE I PROPOSAL ADDRESSES THE DEVELOPMENT OF A 5-MeV ELECTRON ACCELERATOR DESIGNED SPECIFICALLY FOR ROCKET LAUNCH. ALTHOUGH USING ACCEPTED ACCELERATION TECHNIQUES, THE EFFORT WILL BE DIRECTED AT THE DEVELOPMENT OF A VERY COMPACT, LIGHTWEIGHT, HIGH EFFICIENCY, FLIGHT QUALIFIABLE SYSTEM THAT WILL MEET ALL THE REQUIREMENTS OF THE PROPOSED EXPERIMENT. A PRELIMINARY DESIGN WILL BE PREPARED TO THE DETAIL LEVEL NECESSARY FOR EVALUATION OF THE SYSTEM. WE WILL IDENTIFY ALL CRITICAL TECHNICAL ISSUES AND FORMULATE THE PLANS FOR A PHASE II PROGRAM.

BURNETTE RESEARCH ASSOCS INC
2200C SMITH BARRY
ARLINGTON, TX 76013
CONTRACT NUMBER:
DAVID BURNETT
TITLE:
SURFACTANTS FOR EMULSIFICATION OF INTERMOLECULAR EXPLOSIVES
TOPIC# 10 OFFICE: AD/PMR IDENT#: 23367

SUBMITTED BY

BURNETT RESEARCH ASSOCIATES, INC. PROPOSES TO IDENTIFY AND DEVELOP NEW SURFACTANTS CAPABLE OF EMULSIFYING MOLTEN INTERMOLECULAR EXPLOSIVES (IME'S). TO ACCOMPLISH THIS, WE HAVE FORMED A TEAM OF EXPERTS SKILLED IN THE ART AND SCIENCE OF COLLOIDS AND SURFACE CHEMISTRY. MEMBERS OF THIS TEAM ARE RECOGNIZED EXPERTS IN THE PETROLEUM INDUSTRY. CONTROLLING SOLID/LIQUID DISPERSIONS AND LIQUID/LIQUID EMULSIONS FLUIDS HAVE BEEN PROBLEMS FACED BY THE PETROLEUM INDUSTRY IN TWO PARTICULAR AREAS. FACED WITH PROBLEMS SIMILAR TO THOSE WHO FORMULATE IME'S, PETROLEUM INDUSTRIES SPECIALISTS HAVE DEVELOPED NEW SURFACTANT AND FORMULATION TECHNOLOGY IN DRILLING FLUIDS AND IN OIL RECOVERY PROCESSES. THIS NEW TECHNOLOGY CAN BE TRANSFERRED TO THE SPECIFIC PROBLEMS FACING THOSE WHO DEVELOP IMES. FROM THEIR ESTABLISHED BACKGROUND IN EMULSIONS AND DISPERSIONS TECHNOLOGY, OUR TEAM WILL SEEK TO APPLY THIS KNOWLEDGE TO THE IDENTIFICATION OF NEW SURFACTANTS FUNCTIONAL IN INTERMOLECULAR EXPLOSIVES.

BUSINESS & TECHNOLOGICAL SYSTEMS INC
14504 GREENVIEW DR - STE 500
LAUREL, MD 20708
CONTRACT NUMBER: F49620-88-C-0093
WALLACE E LARIMORE
TITLE:
SYSTEM IDENTIFICATION AND FILTERING OF NONLINEAR CONTROLLED MARKOV PROCESSES BY CANONICAL VARIATE ANALYSIS
TOPIC# 239 OFFICE: AFOSR/NM IDENT#: 28659

CURRENT METHODS FOR SYSTEM IDENTIFICATION FOR NONLINEAR MARKOV PROCESSES ARE RESTRICTED TO VERY SPECIAL FORMS OR PROVIDE POOR APPROXIMATIONS TO OPTIMAL PROCEDURES. THE OBJECTIVE OF THE PHASE I RESEARCH IS TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF USING STATE AFFINE MARKOV PROCESSES AND CANONICAL VARIATE ANALYSIS (CVA) FOR OBTAINING APPROXIMATIONS TO OPTIMAL NONLINEAR PROCEDURES FOR SYSTEM IDENTIFICATION AND STOCHASTIC FILTERING. A RIGOROUS DEVELOPMENT OF THE HILBERT SPACE THEORY FOR APPROXIMATION OF NONLINEAR CONTROLLED MARKOV PROCESSES BY STATE SPACE AFFINE MODELS AND BY CANNONICAL VARIATE ANALYSIS IS PROPOSED. FINITE DIMENSIONAL STATE AFFINE MODELS OBTAINED BY TRUNCATION OF THE INFINITE DIMENSIONAL CVA WILL BE USED

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TO DERIVE PRACTICAL COMPUTATIONAL ALGORITHMS FOR APPROXIMATION OF OPTIMAL SYSTEM IDENTIFICATION AND STOCHASTIC FILTERS FOR NONLINEAR SYSTEMS. THE PERFORMANCE OF THESE COMPUTATIONAL ALGORITHMS WILL BE DEMONSTRATED USING A COMPUTER SIMULATION OF A NONLINEAR AEROSPACE SYSTEM. IN PHASE II, THE FULL MATHEMATICAL THEORY WILL BE ELABORATED, DETAILED COMPUTATIONAL AND NUMERICAL ALGORITHMS WILL BE DERIVED, AND COMMERCIAL GRADE SOFTWARE WILL BE DEVELOPED AND DEMONSTRATED ON A FULL SCALE AEROSPACE PROBLEM.

C.T.K. ENTERPRISES
PO BOX 17879
ANAHEIM, CA 92817
CONTRACT NUMBER:
CHARLES T KLEINER
TITLE:
RESEARCH AND DEVELOPMENT OF A HARDENED MAGNETIC REFERENCE
TOPIC# 203 OFFICE: BMO/MYSC IDENT#: 28615

THIS R&D PROJECT IS DIRECTED TOWARD THE DEVELOPMENT OF A NEW APPROACH IN GENERATING A HIGHLY ACCURATE, PREDICTABLE, STABLE AND HARD VOLTAGE AND/OR CURRENT REFERENCE. THIS APPROACH IS BASED ON: (a) A MAGNET USED AS THE BASIC REFERENCE, (b) A MAGNETIC NULL DETECTOR TO GENERATE AN AC ERROR SIGNAL AND (c) AN ELECTRONIC SERVO LOOP. THE PROPOSED PRECISION MAGNETIC REFERENCE IS VIRTUALLY IMPERVIOUS TO NEUTRONS, TOTAL DOSE, IONIZING DOSE-RATES AND SINGLE OR MULTIPLE PARTICLES INCLUDING PARTICLE BEAMS. THE TECHNOLOGY CAN ALSO BE USED TO DEVELOP A COMMERCIAL "LABORATORY STANDARD" AS AN ALTERNATIVE TO STANDARD CELLS.

CAELUM RESEARCH CORP
14325 PICCADILLY RD
SILVER SPRING, MD 20906
CONTRACT NUMBER:
DR HWA-YOUNG M YEH
TITLE:
APPLICATION OF OPTICAL MEASURE THEORY FOR REMOTE TEMPERATURE SENSING
TOPIC# 176 OFFICE: AFGL IDENT#: 27122

SUBMITTED BY

REDUCTION OF SATELLITE RADIANCE DATA TO TEMPERATURE PROFILES INVOLVES BOTH DIFFICULT MATHEMATICAL INVERSION ANALYSIS AS WELL AS COMPLICATED DATA PROCESSING. RECENTLY, THE APPLICATION OF THE OPTICAL MEASURE THEORY REPRESENTS A NOVEL APPROACH WHICH PROVIDE A SOLUTION FREE FROM THE NEED OF EXTERNALLY-IMPOSED CONSTRAINTS (KING, 1987). THE OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP A SYSTEMATIC TECHNICAL APPROACH FOR DETERMINATION OF THE SENSITIVITY OF THE ALGORITHM TO CERTAIN INSTRUMENT DESIGN PARAMETERS; AMONG THEM ARE THE SPECTRAL RESOLUTION OF THE SENSOR, THE SHARPNESS OF THE WEIGHT FUNCTIONS, THE MEASUREMENT NOISE, AND THE NUMBER OF CHANNELS IN THE MEASUREMENT. THE ALGORITHM WILL BE FURTHER STUDIED BY USING SOME SYNTHESIZED RADIANCE DATA, WHICH WILL BE GENERATED IN THE COURSE OF THE STUDY, AND MEASURED SATELLITE RADIANCE DATA FROM NOAA'S TOVS SYSTEMS. THE DATA ANALYSIS WILL INCLUDE THE APPLICATION OF THE ALGORITHM'S PERFORMANCE AGAINST GROUND TRUTH DATA. THE INITIAL STUDY OF APPLYING ADAPTIVE SYSTEMS TECHNIQUES TO THIS RETRIEVAL ALGORITHM WILL ALSO BE GIVEN IN THE PHASE I PERIOD.

CAPE COD RESEARCH INC
PO BOX 600
BUZZARDS BAY, MA 02532
CONTRACT NUMBER:
DR BRIAN G DIXON
TITLE:
AROMATIC HYDROCARBON OPTRODE DEVELOPMENT
TOPIC# 61 OFFICE: AFESC/RDXP IDENT#: 23234

REMOTE DETECTION OF MINUTE CONCENTRATIONS OF AROMATIC HYDROCARBONS IN GROUNDWATER USING STATE-OF-THE ART ANALYTICAL EQUIPMENT IS VERY DIFFICULT. ADDING THE CONSTRAINT OF MAKING THE MEASUREMENTS IN REAL-TIME, AND THE TASK BECOMES IMPOSSIBLE. THIS RESEARCH EXPLORES THE FEASIBILITY OF DEVELOPING A NEW TYPE OF REMOTE REAL-TIME SENSING OPTRODE. THE PROPOSED APPROACH EMPHASIZES ELECTROCHEMI-LUMINESCENCE, AND ENTAILS AN INNOVATIVE ADAPTATION OF THIS EXTREMELY SENSITIVE TECHNIQUE FOR DETECTING AROMATICS.

CAPE COD RESEARCH INC
PO BOX 600
BUZZARDS BAY, MA 02532
CONTRACT NUMBER:
FRANCIS L KEOHAN
TITLE:
ALUMINUM SURFACE TREATMENTS FOR SIMPLIFIED ADHESIVE BONDED REPAIR
TOPIC# 118 OFFICE: AFWAL/ASD IDENT#: 26954

SUBMITTED BY

A PROCESS FOR PREPARING ALUMINUM ALLOYS FOR ADHESIVE BONDING IS PROPOSED WHICH CAN SIGNIFICANTLY SIMPLIFY ADHESIVE BONDED REPAIR IN THE FIELD. THE PROPOSED RESEARCH EXPLORES THE FEASIBILITY OF USING NON-HAZARDOUS SURFACE TREATMENTS ON ALUMINUM ALLOYS WHICH PROVIDE ADHESIVE BONDS WITH EQUAL OR GREATER STRENGTH AND DURABILITY TO THOSE PREPARED BY CONVENTIONAL CHROMIC ACID ETCHING PROCESSES. THE NOVEL SURFACE TREATMENTS SHOULD NOT ONLY PREPARE THE SURFACES FOR BONDING WITH CONVENTIONAL ADHESIVES BUT OFFER A MEANS OF PROTECTING THE ADHESIVE-ADHEREND INTERFACE FROM ENVIRONMENTAL STRESSES SUCH AS HYDROLYTIC DEGRADATION.

CASE CONSULTING INC
1701 N COLLINS BLVD - STE 216
RICHARDSON, TX 75080
CONTRACT NUMBER:
BARNEY B LEIFESTE
TITLE:
COMMON DATA SEMANTICS MODELING PROCESSOR AND RESOLVER TOOL
TOPIC# 120 OFFICE: AFWAL/ASD IDENT#: 26958

THIS DOCUMENT PROPOSES TO ENRICH THE SEMANTICS OF THE IDEF MODELING TECHNIQUES WHILE REDUCING THE COMPLEXITIES INHERENT WITH CURRENT MODELING PROCEDURES. THE IDEF TECHNIQUES WOULD BE MADE MORE ROBUST WITH ADDITIONAL RIGOR AND LEVELS OF ABSTRACTION. GENERIC MANUFACTURING AND ENGINEERING MODELS (TEMPLATES) WOULD BE CONSTRUCTED TO SUPPORT NEEDED DEMONSTRATIONS. THIS PROPOSAL, IF ACCEPTED, WOULD ALSO PRODUCE THE REQUIREMENTS FOR A DATA SEMANTICS MODELING PROCESSOR (DSMP). THE DSMP WOULD NOT ONLY FACILITATE THE CAPTURE OF THE SEMANTICS OF THE IDEF MODELS, BUT WOULD ALSO PROCESS THE SEMANTICS. THE SEMANTICS OF THE MODELS WOULD RESIDE ON AN OBJECT-ORIENTED, RULE-BASED DBMS FROM WHICH INFORMATION COULD BE PROVIDED REGARDING THE ACTUAL MEANINGS OF THE MODELS AND QUERIES AGAINST PHYSICAL INSTANCES OF THE DATA REPRESENTED IN THESEMANTICS OF THE MODELS COULD BE AUTOMATICALLY GENERATED. CURRENTLY AVAILABLE SOFTWARE WOULD BE UTILIZED AS MUCH AS POSSIBLE IN THE DEVELOPMENT OF THE ARCHITECTURE FOR THE DSMP. TOOLS FOR MODEL ADMINISTRATORS ARE ALSO CONCEIVED TO BE PART OF THE DSMP.

CEMCOM RESEARCH ASSOCS INC
10123 SENATE DR
LANHAM, MD 20706
CONTRACT NUMBER:
DR SEAN WISE
TITLE:
MATERIALS FOR SUPPRESSION OF SHOCK PROPAGATION
TOPIC# 8 OFFICE: AD/PMR IDENT#: 23353

SUBMITTED BY

RESEARCH WILL BE CARRIED OUT TO DEMONSTRATE THE UNIQUE VALUE OF CHEMICALLY BONDED CERAMICS (CBC) AS MATERIALS FOR FABRICATION OF MECHANICAL DETERRENTS TO SYMPATHETIC DETONATION OF MUNITIONS. CBC MATERIALS WILL BE FORMULATED AND CHARACTERIZED FOR SHOCK ATTENUATING PROPERTIES AND FRAGMENT CAPTURE OR VELOCITY REDUCTION PROPERTIES. THE FINAL MATERIAL IS LIKELY TO BE A BINARY MATERIAL (TWO DIFFERENT TYPES OF MATERIALS BACK TO BACK) OR A MATERIAL THAT IS HIGHLY ANISOTROPIC IN MATERIALS PROPERTIES. A FAMILY OF THESE MATERIALS WILL BE COMPLETELY CHARACTERIZED (INCLUDING SHOCK HUGONIOT DATA) TO ANALYTICALLY DETERMINE THEIR POTENTIAL TO ELIMINATE THE THREAT OF SYMPATHETIC DETONATION IN MUNITIONS.

CENTURY COMPUTING INC
1100 WEST ST
LAUREL, MD 20707
CONTRACT NUMBER:
RICHARD HENDERSON
TITLE:
RRC ADVANCED PROTOTYPE INTERFACE DEVELOPMENT (RAPID)
TOPIC# 105 OFFICE: AFWAL/ASD IDENT#: 26935

CREWSTATION DISPLAYS ARE BECOMING INCREASINGLY COMPLEX AS USER INTERFACE TECHNOLOGIES ADVANCE. THIS COMPLEXITY AND THE RECENT EMPHASIS ON HUMAN FACTORS AND INCREASED CREW WORKLOADS, HAS COMPLICATED THE PROCESS OF PRESENTING INFORMATION IN THE MOST USABLE FORM. CENTURY COMPUTING PROPOSES TO INVESTIGATE THE CURRENT STATE OF USER INTERFACE TECHNOLOGY. THIS INVESTIGATION WILL INCLUDE A REVIEW OF USER INTERFACE METHODS AND GRAPHICS DISPLAY CAPABILITIES. CENTURY WILL SPECIFY THREE ALTERNATIVE USER INTERFACE CONCEPTS FOR A SYSTEM THAT WILL ENABLE CREWSTATION DISPLAY ENGINEERS TO RAPIDLY CREATE AND MODIFY CREWSTATION DISPLAYS. WITH THIS SYSTEM, GRAPHICS OBJECTS CAN BE ASSOCIATED WITH DYNAMIC ATTRIBUTES THAT REPRESENT COCKPIT DISPLAYS, AND CAN BE CONNECTED TO REALTIME SIMULATION DATA THAT VARIES AS A FUNCTION OF TIME. A MAJOR GOAL IS TO SPECIFY A SYSTEM THAT MAKES IT POSSIBLE TO DESIGN AND EVALUATE COCKPIT AND DISPLAYS WITHIN ONE DAY.

CERAMATEC INC
2425 S 900RD W
SALT LAKE CITY, UT 84119
CONTRACT NUMBER:
DR ASHOK C KHANDKAR
TITLE:
AN ADVANCED TECHNOLOGY HIGH POWER DENSITY MINIATURE THERMAL BATTE
TOPIC# 193 OFFICE: BMO/MYSC IDENT#: 28605

SUBMITTED BY

CERAMATEC AND SAFT HAVE FORMED A TEAM AND ARE PLEASED TO JOINTLY PROPOSE AN EFFORT TO DEVELOP, FABRICATE, AND TEST/EVALUATE A PROTOTYPE ADVANCED TECHNOLOGY HIGH POWER DENSITY THERMAL BATTERY SYSTEM. THE BATTERY UTILIZES A HIGH CONDUCTIVITY LOWER OPERATING TEMPERATURE SOLID ELECTROLYTE WHICH OFFERS NO DEGRADATION OF OVC, HAS LOW HEAT REQUIREMENTS AND HIGH INTEGRITY DUE TO ABSENCE OF LIQUID/VOLATILE HASES. THE THRUST OF THE DEVELOPMENT EFFORT WILL BE IN THREE CRITICAL AREAS: (1) SUPERIOR BATTERY MATERIALS AND THIN CELL BIPOLAR DESIGN THAT REDUCES IR SIGNIFICANTLY ALLOWING HIGH POWER DENSITY TO OBTAIN, (2) FAST ELECTROCHEMICAL KINETICS ALLOWING GREATER UTILIZATION OF STOICHIOMETRIC CAPACITY, AND (3) IMPROVES THERMAL MANAGEMENT DUE TO LOWER TEMPERATURE OPERATION. CERAMATEC'S INNOVATIVE MULTIPHASE SOLID ELECTROLYTE, CURRENTLY UTILIZED IN SAFT'S HIGH PERFORMANCE BATTERIES, COUPLED WITH THIN CELL TECHNOLOGY PROVIDES A VIABLE APPROACH TO DEVELOPING HIGH PERFORMANCE BATTERIES CAPABLE OF PROVIDING HIGH PEAK POWER DENSITIES IN VERY SMALL VOLUMES. SAFT, A RECOGNIZED LEADER IN DESIGN, DEVELOPMENT, MANUFACTURE, AND TESTING OF BATTERIES FOR MILITARY/AEROSPACE APPLICATIONS, PROVIDES INPUT IN COMPONENT DESIGN AND ASSEMBLY AND TESTING OF THE BATTERY. CERAMATEC WILL FABRICATE THIN CELLS AND SAFT WILL ASSEMBLE THE BATTERY AND EVALUATE ITS PERFORMANCE.

CERAMICS PROCESS SYSTEMS
840 MEMORIAL DR
CAMBRIDGE, MA 02139
CONTRACT NUMBER: F49620-88-C-0104
JAMES D HODGE
TITLE:
HIGHLY ORIENTED FIBER REINFORCED CERAMIC COMPOSITES
TOPIC# 237 OFFICE: AFOSR/NE IDENT#: 28648

A PROGRAM IS PROPOSED WHERE FIBER REINFORCED CERAMIC-CERAMIC COMPOSITES ARE FABRICATED USING A DIRECTIONAL PRECIPITATION PROCESS. THE SiC-AlN SYSTEM IS PROPOSED AS THE MODEL SYSTEM TO DEVELOP THIS PROCESS. THE SiC-AlN SYSTEM EXHIBITS A COMPLETE SOLID SOLUTION AT HIGH TEMPERATURES WHICH PHASE SEPARATES AT LOWER TEMPERATURES. THIS PHASE SEPARATION CAN BE CONTROLLED TO YIELD HIGHLY OBTAINED SiC FIBERS EMBEDDED IN AN AlN MATRIX OR VICE VERSA.

SUBMITTED BY

CHARLES RIVER ANALYTICS INC
55 WHEELER ST
CAMBRIDGE, MA 02138
CONTRACT NUMBER:
DR GREG L ZACHARIAS
TITLE:
SITUATIONAL AWARENESS METRIC FOR COCKPIT INTERFACE EVALUATION
TOPIC# 65 OFFICE: AAMRL/HSD IDENT#: 26877

THE PRIMARY OBJECTIVE OF THE PHASE I EFFORT IS TO EVALUATE THE FEASIBILITY OF DEVELOPING A SITUATIONAL AWARENESS METRIC FOR ADVANCED COCKPIT CONFIGURATION EVALUATION. THE APPROACH WILL CENTER ON THE SPECIFICATION AND USE OF AN INTEGRATED HUMAN-MACHINE MODEL OF THE OVERALL CREW/VEHICLE SYSTEM, AND ACCOUNT FOR THE HUMAN'S PERCEPTUAL PROCESSING, DATA FUSION, SITUATION ASSESSMENT, AND DECISION MAKING FUNCTIONS. THE MODEL WILL BE USED TO GENERATE AN ESTIMATE OF THE PILOT'S INTERNAL ASSESSMENT OF THE SITUATION, WHICH WILL THEN BE USED TO GENERATE A METRIC OF SITUATIONAL DISPARITY, REFLECTING THE PILOT'S AWARENESS OF THE ACTUAL SITUATION. IN CONJUCTION WITH A FORMAL PROCEDURE FOR COCKPIT INTERFACE DEFINITION, MODEL SIMULATION, AND METRIC EVALUATION, THE PROPOSED APPROACH WILL PROVIDE THE NECESSARY DESIGN GUIDANCE FOR SPECIFYING EFFECTIVE HUMAN-ENGINEERING COCKPITS IN FUTURE AIRCRAFT. WE PROPOSE TO EVALUATE METRIC FEASIBILITY VIA THREE TASKS. WE WILL: 1) DEVELOP A MODEL-BASED SITUATIONAL AWARENESS METRIC, AND A METHOD FOR ITS USE; 2) ENHANCEMENTS TO THE METRIC, AND OUTLINE A PROGRAM FOR EMPIRICAL VALIDATION AND PROTOTYPE DEVELOPMENT. A FINAL REPORT WILL SUMMARIZE THE STUDY'S OBJECTIVES, FINDINGS, AND RECOMMENDATIONS FOR FUTURE WORK.

CHARLES RIVER ANALYTICS INC
55 WHEELER ST
CAMBRIDGE, MA 02138
CONTRACT NUMBER:
DR ALPER K CAGLAYAN
TITLE:
HIERARCHICAL DAMAGE TOLERANT CONTROLLERS FOR SMART STRUCTURES
TOPIC# 93 OFFICE: AFWAL/ASD IDENT#: 26918

SUBMITTED BY

A SMART AEROSPACE STRUCTURE WHICH CAN DETECT AND ISOLATE STRUCTURAL DAMAGE IN REAL-TIME AND PROVIDE ON-LINE RECONFIGURATION OF THE STRUCTURE'S CONTROL SYSTEM UNDER THE DETECTED IMPAIRMENT CONDITIONS WOULD SIGNIFICANTLY BOOST THE RELIABILITY, MAINTAINABILITY AND PERFORMANCE OF CURRENT AND PROPOSED AIR FORCE FLIGHT AND SPACE VEHICLES. HERE, WE PROPOSE TO INVESTIGATE AND DEFINE A SMART AEROSPACE STRUCTURE STARTING FROM A BASELINE ARCHITECTURE CONSISTING OF: SENSOR ARRAYS FOR IMMEDIATE DAMAGE DETECTION SUCH AS IN SITU PIEZOELECTRICS USED IN CONJUNCTION WITH OTHER RIGID AND FLEXIBLE BODY CONVENTIONAL SENSORS; A HIERARCHICAL DAMAGE DETECTION SYSTEM IN WHICH FAILURES ARE IDENTIFIED AT THE LOWEST POSSIBLE LEVEL AND UNRESOLVED SCENARIOS ARE PASSED TO THE NEXT UPPER LEVEL IN THE HIERARCHY; AN IDENTIFICATION SYSTEM WHICH TRANSFORMS THE STRUCTURAL DAMAGE INFORMATION INTO A MODEL SUITABLE FOR THE REDESIGN OF THE ACTIVE CONTROLLER ON-LINE; A DECENTRALIZED CONTROLLER WHICH RECONFIGURES ITSELF ON-LINE BASED ON DETECTED DAMAGE CONDITIONS AND THEIR ESTIMATED LEVELS; AND A REAL-TIME KNOWLEDGE BASED EXPERT SYSTEM IMPLEMENTATION OF THE DAMAGE DETECTION, CONTROL MODEL IDENTIFIER AND RECONFIGURABLE DECENTRALIZED CONTROLLER SYSTEMS BASED ON A KNOWLEDGE COMPILER APPROACH USING GENERAL PURPOSE NUMERIC PROCESSORS.

CHEMICAL DYNAMICS CORP
9560 PENNSYLVANIA AVE
UPPERMARLBORO, MD 20772
CONTRACT NUMBER: F49620-88-C-0085
P K SWAMINATHAN
TITLE:
CALCULATIONS OF KINETIC DATA FOR PROCESSES LEADING TO UV SIGNATUR
TOPIC# 233 OFFICE: AFOSR/NE IDENT#: 28652

FEASIBILITY AND IMPLEMENTATION ISSUES FOR NOVEL THEORETICAL METHODS REQUIRED IN OBTAINING COMPUTATIONAL CROSS SECTION INPUT FOR PLUME ULTRAVIOLET RADIATION CODE (SPURC) MODELS WILL BE ADDRESSED BY CONSIDERING CROSS SECTION FOR FORMATION OF ELECTRONICALLY EXCITED STATES OF SPECIFIC CASE MOLECULES SUCH AS NO, N(2), AND OH RESULTING FROM COLLISIONAL PROCESSES IN THE ATMOSPHERE. ELECTRONICALLY INELASTIC DYNAMICS INVOLVING SEVERAL ATOMS IN A MOLECULAR COLLISION LEADING TO METASTABLE SPECIES, RADIATIVE QUENCHING ETC. WILL BE

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TREATED BY EMPLOYING NOVEL SEMICLASSICAL TECHNIQUES. WE WILL IDENTIFY RELEVANT ELECTRONIC STATES, COUPLING AND KEY SCATTERING PROBLEMS THAT WILL HAVE TO BE SOLVED AND DEVELOP AND VALIDATE THE NECESSARY THEORETICAL METHODS DURING PHASE I. THE ACTUAL DETAILED COMPUTATIONS INCLUDING QUANTUM CHEMISTRY INPUT, AND DYNAMICAL STUDIED ARE BEING PLANNED FOR PHASE II. THE THEORETICAL METHODOLOGY TO BE DEVELOPED CAN BE APPLIED TO A NUMBER OF DEFENSE-RELATED AS WELL AS COMMERCIAL TARGET PROBLEMS WHERE IMPLEMENTATIONS TO PROVIDE COMPUTATIONAL SUPPORT AS WELL AS QUALITATIVE TO QUANTITATIVE LEVELS OF INSIGHT ARE POSSIBLE.

CHEMICAL DYNAMICS CORP
9560 PENNSYLVANIA AVE
UPPER MARLBORO, MD 20772
CONTRACT NUMBER: F49620-88-C-0086
C S MURTHY
TITLE:
GROWTH STUDIES OF METAL-METAL/SEMICONDUCTOR STRUCTURES
TOPIC# 236 OFFICE: AFOSR/NE IDENT#: 28654

THE LONG-TERM OBJECTIVE OF THIS RESEARCH IS TO PROVIDE A WEALTH OF CRUCIAL DATA ON COMMERCIALLY RELEVANT HETEROSTRUCTURE MATERIALS. THE DATA WILL INVOLVE REASONABLY ACCURATE METAL, SEMICONDUCTOR, INSULATOR INTERACTIONS TO OBTAIN CONDITIONS OF GROWTH AND POSSIBLY NOVEL GROWTH APPROACHES VIA COMPUTER SIMULATIONS. THE RESEARCH PROGRAM PROPOSES IS THUS AN ESSENTIAL STEP TOWARDS REALISTIC SIMULATION OF GROWTH PROCESSES IN COMMERCIALLY RELEVANT ELECTRONIC MATERIALS. THE RESEARCH INVOLVES THE APPLICATION OF BOTH EFFECTIVE MEDIUM THEORIES AND PHENOMENOLOGICAL APPROACHES TO MODEL THE ATOMIC INTERACTIONS AND OF COMPUTER "EXPERIMENTS" TO PERFORM AND UNDERSTAND THE FORMATION OF HETEROSTRUCTURES, BETWEEN METAL, SEMICONDUCTOR, AND INSULATOR MATERIALS. BESIDES PROVIDING A DETAILED UNDERSTANDING OF THE INITIAL AND SUBSEQUENT STAGES OF THE GROWTH FRONT AND INTERFACE, THIS RESEARCH IS ALSO EXPECTED TO PRODUCE A COMPUTER PROGRAM TO BE MARKETED INDEPENDENTLY OR COMBINED WITH OTHER RELATED PACKAGES. PHASE I RESEARCH INVOLVES INVESTIGATION OF THE DETAILED DYNAMICS OF A LARGE NUMBER OF ATOMS IN ORDER TO UNDERSTAND THE ROLES OF ENERGETICS AND DYNAMICS IN CONTROLLING EPITAXIAL GROWTH. APPLICATIONS TO AT LEAST ONE METAL-METAL AND METAL-SEMICONDUCTORS, SUCH AS Cu/Fe AND Fe/Si

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OR Ge IS PLANNED. MORE COMPLEX DYNAMICAL PROCESSES OCCURRING NEAR INTERFACES WHICH INCLUDE SEMICONDUCTOR ON INSULATORS AND DEVICES WILL BE STUDIED IN PHASE II. INNOVATIVE SIMULATION METHODOLOGIES WILL BE DEVELOPED AND EMPLOYED TO DESCRIBE NONEQUILIBRIUM GROWTH.

CIM SYSTEMS INC
275 W CAMPBELL RD - STE 411
RICHARDSON, TX 75080
CONTRACT NUMBER:
J HOLT/DR J PRIEST
TITLE:
DESIGN FOR PRODUCIBILITY TOOLS FOR ELECTRONIC SYSTEMS
TOPIC# 34 OFFICE: ESD/XRB IDENT#: 28601

THIS PROJECT IS TO DEVELOP A SET OF DESIGN-FOR-PRODUCIBILITY (DFP) TOOLS AND GUIDELINES FOR ELECTRONIC SYSTEMS. THE GUIDELINES WILL COVER ALL LEVELS OF ELECTRONIC SYSTEM INTERCONNECTION: BASE MATERIALS, BARE BOARDS, BOARD ASSEMBLIES, CONNECTORS, WIRE AND CABLE HARNESSES, RACKS, CHASSIS, CABINETS, AND PERIPHERAL ASSEMBLIES. THE GUIDELINES WILL INCLUDE GOOD MANUFACTURABILITY, TESTABILITY, AND INSPECTABILITY, AND MAINTAINABILITY PRACTICES. RELEVANT PARAMETERS FROM APPLICABLE MILITARY SPECIFICATIONS AND STANDARDS WILL BE INCORPORATED INTO THE GUIDELINES. THE GUIDELINES WILL BE STRUCTURED TO ENABLE ELECTRONICS SYSTEMS CUSTOMERS TO EVALUATE CONTRACTOR PERFORMANCE AND WILL BE PUBLISHED IN BOTH HARD COPY HANDBOOK AND COMPUTER SOFTWARE VERSIONS. A CONTINUOUS CAPABILITY WILL BE PROVIDED FOR CHANGES IN THE STATE OF THE MANUFACTURING ART WITH NEW MATERIALS, MANUFACTURING, TEST AND INSPECTION EQUIPMENT AND TECHNIQUES.

CIM SYSTEMS INC
275 W CHAMPBELL RD - STE 411
RICHARDSON, TX 75080
CONTRACT NUMBER:
M FLOWER/DR J PRIEST
TITLE:
DESIGN PRODUCIBILITY ASSESSMENT SYSTEM
TOPIC# 221 OFFICE: BMO/MYSC IDENT#: 28639

SUBMITTED BY

CURRENT DESIGN PRODUCIBILITY ENGINEERING RELIES ON THE USE OF CHECKLISTS AND THE EXPERIENCE OF THE DESIGNER AND THE MANUFACTURING ENGINEER TO INTEGRATE MANUFACTURING REQUIREMENTS INTO THE OVERALL DESIGN OF AN ITEM. APART FROM THE USE OF VERY GENERALIZED CHECK-LISTS, THERE EXISTS NO ESTABLISHED SET OF CRITERIA OR DESIGN STANDARDS ACROSS THE DEFENSE INDUSTRY WHICH THE DESIGNER CAN FOLLOW TO ENSURE THE PRODUCIBILITY OF A GIVEN DESIGN WHILE THE CONCEPTS ARE FIRST BEING DEVELOPED. THE COMPUTERIZATION OF THIS PROCESS SO AS TO AUTOMATE THE DESIGN PRODUCIBILITY ANALYSIS IS THE PRIMARY OBJECTIVE OF THIS PROPOSAL. THE END PRODUCT OF THIS RESEARCH PROJECT WILL BE A SET OF CRITERIA OR STANDARDS WHICH CAN BE OBJECTIVELY APPLIED TO THE SPECIFIC ASPECTS OF ALL TYPES OF HARDWARE DESIGNS. THESE CRITERIA WILL BE CAPABLE OF BEING ASSIGNED QUANTITATIVE RATINGS WHICH CAN BE WEIGHTED BASED ON PROGRAM NEEDS. THESE WEIGHTED RATINGS CAN THEN BE TOTALED TO ARRIVE AT A QUANTITATIVE MEASURED FOR THE PRODUCIBILITY OF A GIVEN DESIGN. THE CRITERIA WILL BE DEVELOPED SO THAT DIFFERENT DESIGN APPROACHES CAN THEN BE COMPARED, AND WHERE PERFORMANCE IS COMPARABLE, ALTERNATIVE WITH HIGHER PRODUCIBILITY RATINGS CAN BE SELECTED. THE FINALIZED SET OF CRITERIA SHOULD BE CAPABLE OF BEING DRAFTED IN THE FORM OF A MIL-STANDARD AND PLACED ON AN AUTOMATED DATA PROCESSING SYSTEM.

COLEMAN RESEARCH CORP
401 WYNN DR
HUNTSVILLE, AL 35805
CONTRACT NUMBER:
GORDON D JUDY
TITLE:
SIMUATION METHODOLOFY FOR EVALUATION OF NEW GUIDANCE AND CONTROL TECHNOLOGIES
TOPIC# 199 OFFICE: BMO/MYSC IDENT#: 28614

THIS STUDY WILL LAY THE GROUNDWORK FOR THE DEVELOPMENT OF A SIMULATION SYSTEM WHICH WILL PERMIT THE RAPID AND THOROUGH EVALUATION OF NEW AND EMERGING ICBM GUIDANCE AND CONTROL TECHNOLOGIES. EXISTING SIMULATIONS AND MODELS OF SUBSYSTEMS AND COMPONENTS WILL BE COL-LECTED, VALIDATED AND SCREENED FOR APPLICABILITY AND INCLUSION IN THE SIMULATION TOOL. THE PROPOSED SIMULATION SYSTEM ARCHITECTURE

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ALLOWS FOR THE EFFICIENT INTEGRATION OF THESE MODELS AND A STRAIGHT-FORWARD, DETAILED COMPARATIVE EVALUATION OF THEIR IMPACT UPON ICBM SYSTEM PERFORMANCE. THE SIMULATION PHILOSOPHY TO BE EMPLOYED IS A STRUCTURED, TOP DOWN, MODULAR APPROACH WHICH ESTABLISHES THE DESIRED EVALUATION METHODOLOGY. THIS SIMULATION ARCHITECTURE APPROACH IS BASED UPON AN EXISTING VALIDATED SOFTWARE TOOL CURRENTLY IN USE. THE DESCRIPTION INCLUDES DISCUSSIONS OF THE I/O INTERFACE, THE SIMULATION OPERATION AND DOCUMENTATION.

COMMAND SYSTEMS GROUP INC
23430 HAWTHORNE BLVD - STE 150
TORRANCE, CA 90505
CONTRACT NUMBER:
EARL J ANTHONY
TITLE:
ENHANCED MODELING AND NEURAL NETWORKS FOR AUTONOMOUS AIR VEHICLE OPERATIONS
TOPIC# 149 OFFICE: AFWAL/ASD IDENT#: 27008

THE FEASIBILITY OF AN ALTERNATIVE APPROACH TO AUTONOMOUS OPERATION OF AN UNMANNED AIR VEHICLE (UAV) IN A RSTA ENVIRONMENT WILL BE STUDIED. THE APPROACH EMPLOYS AN ENHANCED MODEL OF THE SOFTWARE "FLIGHT CREW" COUPLED WITH ADAPTIVE LEARNING ALGORITHMS. A SYSTEM IS PROPOSED THAT WILL DECENTRALIZE CRITICAL UAV C2 FUNCTIONS AND OPTIMIZE COMMUNICATIONS, SUCH THAT GROUND STATION WORKLOAD/MANPOWER IS MINIMIZED, THE VEHICLE IS ALLOWED TO OPERATE IN ENEMY'S DEEP WITHOUT CONSTANT DATA-LINK, AND THE VEHICLE CAN REACT TO DANGEROUS OR OPPORTUNISTIC SITUATIONS WITHOUT THE DOWNLINK, GROUND STATION REPLAN, UPLINK DELAY. THE STUDY WILL INCLUDE AN ANALYSIS OF THE PARAMETER SPACE REQUIRED FOR AN EFFECTIVE REAL-TIME NEURAL NETWORK-BASED SYSTEM AND A MORE NATURAL GROUND STATION/UAV DIVISION OF LABOR (BASED ON MANNED FLIGHT CREW ARCHITECTURE). THIS WILL ENHANCE SURVIVABILITY AND THE ACCOMPLISHMENT OF MISSION OBJECTIVES. THE ADA-BASED SYSTEM WILL BE COUPLED TO AN EXISTING GROUND-BASED MISSION PLANNER (COMMON LISP ON IBM AT) THAT PROVIDES FLIGHT PROFILES FOR RSTA MISSIONS IN THREAT ENVIRONMENTS.

COMPU-CAD INC
20 CONSTITUTION DR
TAUNTON, MA 02780
CONTRACT NUMBER:
ERNEST E SAAB
TITLE:
SHELTER HIGHLY ERECTABLE DOME
TOPIC# 57 OFFICE: AFESC/RDXP IDENT#: 23199

SUBMITTED BY

THIS DOCUMENT PROPOSES TO INVESTIGATE THE POSSIBLE EXISTENCE OF A SHELTER CAPABLE OF PROVIDING PROTECTION TO PERSONNEL FROM THE ENVIRONMENT DURING MAINTENANCE AND MUNITIONS LOADING OF AIRCRAFT SUCH AS THE A-10 ON THE FLIGHTLINE. THE SHELTER MUST BE ABLE TO WITHSTAND BOTH TROPIC AND ARCTIC ENVIRONMENTS AND BE LIGHTWEIGHT, AIR-MOBILE AND EASILY ERECTED. IF NO SUCH SHELTER EXISTS, THIS EFFORT WILL PROVIDE A PRELIMINARY DESIGN OF A SHELTER, USING DATA FROM THE RESEARCH CONDUCTED, WHICH FULFILLS THE AIR FORCE'S REQUIREMENTS. A MARKET SEARCH IN THE FORM OF LETTERS, TELEPHONE CALLS AND VISITS TO FACILITIES SHALL FORM THE BASIS OF THE INVESTIGATION TO EXPLORE THE POSSIBLE EXISTANCE OF SHELTERS AVAILABLE OFF-THE-SHELF COMMERCIALLY OR THAT ARE CURRENTLY USED BY THE MILITARY. A COMPREHENSIVE STUDY UTILIZING A DATA BASE WILL SORT OUT THE NUMEROUS COMMERCIAL AND MILITARY SHELTER WHICH HAVE BEEN PROPOSED, DESIGNED, ACCEPTED AND READILY VAILABLE OR ARE IN ONE OF THESE STAGES. THE RESEARCH WILL INCLUDE INVESTIGATION OF SHELTERS THAT WITH MINOR ALTERATION OR REDESIGN, WILL MEET ALL REQUIREMENTS SPECIFIED BY THE AIR FORCE. ALSO INVESTIGATED WILL BE SHELTERS WHOSE CONFIGURATION MAY CONTRIBUTE TO A PRELIMINARY DESIGN SHOULD NO SHELTER BE FOUND READILY AVAILABLE. IN THIS CASE, TECHNOLOGIES OF EXISTING SHELTERS SHALL BE COMBINED INTO ONE UNIQUE CONFIGURATION FITTING THE DESIGN AND PERFORMANCE OBJECTIVES ESTABLISHED IN THIS DOCUMENT AND BY THE AIR FORCE.

COMPUTER COMMAND & CONTROL CO
2401 WALNUT ST - STE 402
PHILADELPHIA, PA 19103
CONTRACT NUMBER: F49620-88-C-0116
EVAN LOCK
TITLE:
AN INTELLIGENT MATHEMATICAL MODELLING SYSTEM--MATHMODEL
TOPIC# 239 OFFICE: AFOSR/NM IDENT#: 28657

THE PROPOSED SYSTEM RESPONDS TO THE NEED OF MATHEMATICAL MODELERS OF LARGE SYSTEMS, IN ENGINEERING AND SCIENCES, FOR RELIEF IN THIS ARDUOUS AND IMMENSELY COMPLEX TASK. IN PARTICULAR, RELIEF IS NEEDED ON A GENERAL PURPOSE BASIS IN THREE AREAS: REDUCING THE AMOUNT OF WORK, REDUCING THE REQUISITE USER KNOWLEDGE--ESPECIALLY OF COMPUTERS AND NUMERICAL METHODS, AND ENHANCING THE EFFICIENCY OF THE VERY

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LENGTHLY COMPUTATIONS. EXISTING SYSTEMS ARE ORIENTED TO RESPECTIVE NARROW AREAS AND ARE INEFFICIENT. THEY ALSO LACK THE INTELLIGENCE THAT CAN EFFECTIVELY AID A USER. THE PROPOSED SYSTEM INTEGRATES FOUR AREAS OF TECHNOLOGY: (i) SPECIFICATION LANGUAGE AND AUTOMATED GENERATION OF PROGRAMS, (ii) VERIFICATION OF MATHEMATICAL CORRECTNESS: (iii) SYMBOLIC MANIPULATION AND (iv) NUMERICAL ANALYSIS. THE SPECIFICATION LANGUAGE IS THAT OF REGULAR AND BOLLEN ALEGEBRA--WHICH LENDS THE SYSTEM ITS GENERAL PURPOSE CAPABILITIES. IT GENERATES HIGHLY OPTIMAL PROGRAMS AND GUIDES THE USER IN IMPROVING EFFICIENCY OF ALGORITHMS. THE VERIFICATION PART GUIDES THE USER IN COMPOSING A COMPLETE AND CONSISTENT MODEL. EQUATIONS AND OPTIMIZATIONS ARE THEN MANIPULATED INTO A FORM ACCEPTABLE BY APPROPRIATE NUMERIC METHODS ARE USED. FINALLY--A FAST PROTOTYPING PART FEEDS BACK THE COMPUTED RESULTS TO THE USER. THE SYSTEM HAS BEEN DEVELOPED AS PART OF A PhD DISSERTATION RESEARCH. THE PHASE I OBJECTIVES ARE TO TRANSFORM IT INTO A RELIABLE AND ROBUST SYSTEM AND DEMONSTRATE ITS ADVANTAGES IN REAL LIFE LARGE APPLICATIONS. THIS WILL PROVIDE A BASIS FOR READYING THE SYSTEM FOR LARGE SCALE USE IN PHASE II.

COMPUTER SCIENCE & APPLICATIONS INC
2 DAVID ST - STE H
FORT WALTON BEACH, FL 32548
CONTRACT NUMBER:
FREELAND D CRUMLY
TITLE:
MODEL FOR CHAFF RADAR RETURNS FOR MISSILE TARGET DETECTING DEVICE
TOPIC# 18 OFFICE: AD/PMR IDENT#: 23400

THIS RESEARCH WILL IDENTIFY AND EXAMINE THE FACTORS AFFECTING MISSILE TARGET DETECTING DEVICES WHEN PRESENTED WITH CHAFF COUNTERMEASURES. THIS RESEARCH WILL INCLUDE BUT NOT BE LIMITED TO AN EXHAUSTIVE INVESTIGATION OF PERTINENT LITERATURE AND PERSONAL INTERVIEWS WITH RECOGNIZED EXPERTS IN THE FIELD. FROM THIS RESEARCH, SEVERAL ALGORITHMS, VARYING IN COMPLEXITY, WILL BE DEVELOPED FOR PREDICTING THE EFFECTS OF CHAFF ON MTDD IN THE NEAR FIELD. A PLAN WILL BE DEVELOPED FOR ANALYTICALLY EXAMINING THE UTILITY AND RELATIVE MERIT OF EACH OF THE ALGORITHMS UNDER SIMPLE SCENARIOS. THOSE ALGORITHMS DEMONSTRATING THE GREATEST POTENTIAL WILL BE SELECTED FOR ADDITIONAL REFINEMENT. A FULLY DOCUMENTED METHODOLOGY WILL BE

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DEVELOPED WHICH WILL ALLOW THE INTEGRATION OF THESE ALGORITHMS INTO PRESENT AND FUTURE AIR-TO-AIR MISSILE END-GAME PROGRAMS.

CORDRAY RESEARCH INC
PO BOX 21617
DENVER, CO 80221
CONTRACT NUMBER:
ROBERT K CORDRAY
TITLE:
AERODYNAMIC ANALYSIS OF SUBSONIC VERTICAL TAKE-OFF AND LANDING AIR VEHICLE
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 26995

THE ADVENT OF THE CORDRAY ROTARY ENGINE HAS MADE POSSIBLE SUBSTANTIAL INCREASES IN THE POWER TO WEIGHT RATIO AVAILABLE TO THE AIRCRAFT DESIGNER. ENGINE SELECTION IS HISTORICALLY THE PRIMARY DETERMINATIVE OF VEHICLE DESIGN AND PERFORMANCE. THE AVAILABILITY OF THIS ENGINE ALONG WITH ADVANCES IN COMMAND AND CONTROL ELECTRONICS MAKES POSSIBLE A NEW CLASS OF VEHICLE CAPABLE OF VERTICAL TAKE OFF AND THEN TRANSITIONING TO HORIZONTAL FLIGHT A MID SUBSONIC SPEEDS AND THEN TRANSITIONING BACK TO HOVER FOR LANDING OR MISSION OBJECTIVES. THIS VEHICLE WOULD HAVE SUFFICIENT POWER FOR TAKE OFF WITH FULL FUEL AND REASONABLE PAYLOAD WEIGHTS WITH ADEQUATE PERFORMANCE RESERVES FOR LONG RANGE OPERATION AND HIGH ALTITUDE HOVER USING A DUCTED FAN PROPULSION SYSTEM. THE PHASE I OBJECTIVE IS TO PERFORM AERODYNAMIC ANALYSIS AND WIND TUNNEL TESTING OF A SCALE MODEL VEHICLE IN ORDER TO EVALUATE STABILITY AND CONTROL IN BOTH HOVER AND HORIZONTAL FLIGHT MODES AS WELL AS EVALUATION OF DRAG COMPONENTS AND TO ESTABLISH CRITERIA FOR A PHASE II UNMANNED AIR VEHICLE WITH A TAKE OFF WEIGHT OF 250 POUNDS.

CORDRAY RESEARCH INC
PO BOX 21617
DENVER, CO 80221
CONTRACT NUMBER:
ROBERT K CORDRAY
TITLE:
HIGH POWER DENSITY INTERNAL COMBUSTION ENGINE FOR RPV'S
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 26996

SUBMITTED BY

THE CURRENT CLASS OF SMALL PISTON ENGINES AS USED IN VARIOUS REMOTELY PILOTED VEHICLES AND SMALL AIRCRAFT SUFFER FROM A LACK OF POWER DENSITY AND HIGH VIBRATION LEVELS. THE CORDRAY ROTARY ENGINE IS A NEW TYPE OF INTERNAL COMBUSTION ENGINE OPERATING ON THE OTTO CYCLE PRINCIPLE THAT OFFERS AT LEAST A FOURFOLD INCREASE IN POWER DENSITY OVER PISTON ENGINES AND A SIGNIFICANT DECREASE IN VIBRATION. IN ADDITION, THIS ENGINE WOULD IMPROVE VEHICLE RANGE VIA IMPROVED THERMAL EFFICIENCY WHILE REDUCING MECHANICAL COMPLEXITY AND COST. THIS DESIGN ALSO WOULD IMPROVE UPON EXISTING VOLUMETRIC EFFICIENCY AND RELIABILITY. THE OBJECTIVE OF THE PROPOSED EFFORT IS TO BUILD AN ENGINE OF THIS TYPE ON A DEMONSTRATION BASIS. PHASE II OF THIS EFFORT WILL BE TO DEVELOP, TEST AND EVALUATE A MISSION READY PROPULSION SYSTEM.

CREARE INC
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER:
JAVIER A VALENZUELA
TITLE:
A COMPACT HIGH PERFORMANCE HEAT EXCHANGER FOR THERMAL MANAGEMENT OF HYPERSONIC AEROSPACE VEHICLES
TOPIC# 97 OFFICE: AFWAL/ASD IDENT#: 26924

THERMAL MANAGEMENT SYSTEMS FOR HYPERSONIC AEROSPACE VEHICLES MUST SIMULTANEOUSLY MEET THREE CHALLENGING REQUIREMENTS: (1) HEAT MUST BE REMOVED AT VERY HIGH HEAT FLUXES FROM SURFACES SUCH AS THE COMBUSTION CHAMBER WALL AND AERODYNAMICALLY HEATED SURFACES, (2) THE PROPELLANT MUST BE PREHEATED TO VERY HIGH TEMPERATURES PRIOR TO COMBUSTION, AND (3) THE SYSTEM'S SIZE AND MASS MUST BE HELD TO A MINIMUM. THE PROPOSED EFFORT WILL DEVELOP AN INNOVATIVE HEAT EXCHANGER WHICH MEETS ALL THESE REQUIREMENTS USING SUPERCRITICAL HYDROGEN COOLANT. THE PROPOSED DESIGN ACHIEVES VERY HIGH HEAT FLUXES AT A SIZE AND MASS WHICH ARE MUCH LESS THAN POSSIBLE WITH CONVENTIONAL HEAT EXCHANGER TECHNOLOGY. SYSTEM MASS IS FURTHER REDUCED BECAUSE INTERMEDIATE TWO-PHASE COOLANT LOOPS ARE UNNECESSARY, AND COOLANT PUMPING POWER REQUIREMENTS ARE REDUCED DUE TO THE LOW PRESSURE DROP CHARACTERISTICS OF THE PROPOSED HEAT EXCHANGED. PAY-

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OFFS OF THE PROPOSED EFFORT ARE REDUCED MASS FOR THE INTERNAL THERMAL MANAGEMENT SYSTEM, EFFECTIVE COOLING OF CRITICAL HIGH-HEAT FLUX SURFACES AND EFFICIENT PREHEATING OF PROPELLANT PRIOR TO COMBUSTION.

CREARE INC
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER:
BHARATAN R PATEL
TITLE:
COMPUTATIONAL MODEL FOR THRUST REVERSING/VECTORING JET
TOPIC# 104 OFFICE: AFWAL/ASD IDENT#: 26932

COMPUTATIONAL FLUID DYNAMICS (CFD) OFFERS SIGNIFICANT OPPORTUNITIES IN THE DESIGN OF V/STOL FIGHTER AIRCRAFT. THERE IS ENORMOUS SCOPE FOR A SYNERGISM BETWEEN CFD AND WIND TUNNEL TESTING, AFFORDING GREATER EFFICIENCY IN THE REDUCTION OF DATA AND A QUICKER GRASP OF ITS SIGNIFICANCE. MOREOVER, CFD SHOULD BE ABLE TO DRASTICALLY REDUCE THE NUMBER OF TESTS THAT ARE NEEDED. THE OVERALL PROJECT OBJECTIVE IS TO DEVELOP A TIME-DEPENDENT, COMPRESSIBLE, THREE-DIMENSIONAL, NAVIER-STOKES MODEL(S) FOR THRUST VECTORING/REVERSING JETS. THE PROPOSED APPROACH IS TO USE THE CFD CODE FLUENT TO SIMULATE SELECTED SUBSONIC FLOW FIELD FOR WHICH EXPERIMENTAL DATA EXISTING USING THE STANDARD K-E MODEL AND THE HIGHER ORDER ALGEBRAIC STRESS MODEL (ASM). BASED ON THE COMPARISON OF THE SIMULATIONS WITH DATA, THE MOST EFFICIENT APPROACH IN TERMS OF PREDICTION ACCURACY AND COMPUTATIONAL SPEED WILL BE DETERMINED. THE MODELS AND COMPUTATIONAL APPROACHES SELECTED IN PHASE I WILL BE IMPLEMENTED IN PHASE II TO PRODUCE THE DESIRED CODE FOR THRUST VECTORING/REVERSING JETS. THE PHASE II IMPLEMENTATION WILL INCLUDE REFINEMENT AND ENHANCEMENT OF THE GRID AND SELECTED TURBULENCE MODELS, AND IF DESIRED, INCORPORATION OF LARGE EDDY SIMULATION (LES) MODELS AND OTHER CFD CODES DEVELOPED AT CREARE WHICH USE ADVANCED MULTI-GRID SOLUTION TECHNIQUES.

CREARE INC
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER:
CHRISTOPHER J CROWLEY
TITLE:
DESIGN MANUAL FOR MICROGRAVITY TWO-PHASE FLOW AND HEAT TRANSFER
TOPIC# 170 OFFICE: AFAL IDENT#: 27115

SUBMITTED BY

THE NEXT GENERATION OF INNOVATIVVE CONCEPTS FOR THERMAL DEVICES FOR POWER SYSTEMS AND THERMAL LOOPS IN SPACECRAFT INVOLVE TWO-PHASE FLOW. THESE DEVICES UTILIZES THE LIQUID-VAPOR PHASE CHANGE IN BOILING AND CONDENSING PROCESSES IN ORDER TO TAKE ADVANTAGE OF THE HIGHER HEAT TRANSPORT RATES, LOWER WEIGHT, AND NEAR-ISOTHERMAL OPERATION AND CONTROL OF TWO-PHASE SYSTEMS COMPARED WITH CONVENTIONAL APPROACHES. THE AIM OF THIS PROJECT IS TO PROVIDE A UNIQUE DESIGN GUIDEBOOK (A DOCUMENTED DESIGN MANUAL) FOR TWO-PHASE DEVICES FOR VARIABLE GRAVITY ENVIRONMENTS, INCLUDING MICROGRAVITY.

CREATIVE OPTICS INC
32 WILDWOOD DR
BEDFORD, MA 01730
CONTRACT NUMBER:
DR ROBERT HOHLFELD
TITLE:
NOVEL METHODOLOGY FOR APPLICATION OF ADAPTVIE SYSTEMS TECHNIQUES TO DMSP REMOTE TEMPERATURE SENSING
TOPIC# 176 OFFICE: AFGL IDENT#: 27123

THE DIFFERENTIAL INVERSION TECHNIQUE DEVELOPED BY KING SHOWS EXCITING PROMISE AS A MEANS FOR OBTAINING ATMOSPHERIC TEMPERATURE PROFILES FROM UPWELLING INFRARED AND MICROWAVE RADIANCE DATA WITHOUT THE USE OF A PRIORI INFORMATION ABOUT THE STRUCTURE OF THE ATMOSPHERE. THE DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP) VEHICLES GENERATE A DATA SET OF UPWELLING RADIANCE SUITABLE FOR APPLICATION OF THE DIFFERENTIAL INVERSION ALGORITHM. PRACTICAL APPLICATION OF THE DIFFERENTIAL INVERSION ALGORITHM REQUIRES CAREFUL ATTENTION TO THE NUMERICAL INSTABILITIES INHERENT TO AN INVERSION TECHNIQUE BASED ON A LAPLACE TRANSFORM. NUMERICAL STUDIES BASED ON WEIGHT FUNCTIONS APPROPRIATE TO THE DMSP INSTRUMENTATION, AND MAKING USE OF SYNTHETIC RADIANCE DATA, WILL ALLOW ACCURATE DETERMINATION OF THE STABILITY OF THE DIFFERENTIAL INVERSION ALGORITHM AS APPLIED TO DMSP RADIANCE DATA. EXTENSIONS TO THE DIFFERENTIAL INVERSION ALGORITHM ARE EXPECTED TO IMPROVE ITS NUMERIC STABILITY WHILE PRESERVING ITS COMPUTATIONAL EFFICIENCY AND DESIRABLE THEORETICAL PROPERTIES. A NEW METHODOLOGY WILL BE DEVELOPED ALLOWING RAPID AND TIMELY REDUCTION OF DMSP DATA SUITABLE FOR USE IN AIR FORCE TACTICAL OPERATIONS AND

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OTHER APPLICATIONS. HARDWARE DEVELOPED IN THE PHASE II EFFORT FOR DELIVERY TO AFGL WILL IMPLEMENT THESE ADVANCES IN THE APPLICATION OF THE DIFFERENTIAL INVERSION ALGORITHM.

CREE RESEARCH INC
2100 WESTPARK DR
RSCH TRIANGLE PK, NC 27713
CONTRACT NUMBER:
DR JOHN W PALMOUR
TITLE:
DEVELOPMENT OF SILICON CARBIDE METAL-SEMICONDUCTOR FIELD-EFFECT TRANSISTORS FOR HIGH POWER OPERATION AT HIGH TEMPERATURES
TOPIC# 127 OFFICE: AFWAL/ASD IDENT#: 26967

SILICON CARBIDE POSSESSES A UNIQUE COMBINATION OF PROPERTIES THAT ALLOW SIMULTANEOUS HIGH TEMPERATURE AND HIGH POWER OPERATION OF ELECTRONIC DEVICES MADE FROM THIS MATERIAL. THE CUBIC FORM OF SiC (BETA) HAS A WIDE BANDGAP (2.2 eV @ 27 DEG C), WHICH THEORETICALLY GIVES A MAXIMUM OPERABLE TEMPERATURE OF 925 DEG C. ALPHA SiC (6H) HAS AN EVEN WIDER BANDGAP OF 2.86 Ev @ 27 DEG C, GIVING A MAXIMUM OPERABLE TEMPERATURE OF 1240 DEG C. BOTH FORMS ALSO HAVE A HIGH BREAKSOWN ELECTRIC FIELD OF 4x10(6) V/cm (10 TIMES THAT OF Si & GaAs), WHICH ALLOWS HIGH POWER OPERATION. RECENT RESEARCH ON SiC HAS RESULTED IN THE FABRICATION OF MESFETS AND MOSFETS THAT, FOR THE FIRST TIME, SHOW OPERATION AT HIGH TEMPERATURES. WHILE THE MOSFETS HAD VERY GOOD CURRENT-VOLTAGE CHARACTERISTICS UP TO 650 DEG C, THE MESFET OPERATION WAS LIMITED TO 350 DEG C BECAUSE OF REACTION OF THE GOLD SCHOTTKY CONTACT WITH THE SiC, AND BY THE LOWER QUALITY MATERIAL (BETA-SiC ON Si SUBSTRATES) USED FOR THESE SCHOTTKY BARRIED DEVICES. HOWEVER, RECENT RESEARCH HAS ALSO YIELDED MUCH BETTER SCHOTTKY CONTACTS FOR HIGH TEMPERATURE (PLATINUM OR PLATINUM SILICIDE) AND PROCESSES FOR GROWING BOTH BETA-SiC AND 6H-SiC THIN FILMS THAT HAVE MUCH LOWER DEFECT DENSITY THAN THAT MENTIONED PREVIOUSLY. IT IS HEREIN PROPOSED TO FABRICATE MESFETS IN THE HIGHER QUALITY SiC THIN FILMS (BOTH BETA AND 6H) USING PLATINUM BASED SCHOTTKY CONTACTS IN ORDER TO DECREASE THE ...THRESHOLD LEAKAGE CURRENT AND INCREASE THE MAXIMUM OPERABLE TEMPERATURE OF THESE DEVICES.

CRYSTAL SYSTEMS INC
27 CONGRESS ST
SALEM, MA 01970
CONTRACT NUMBER:
DR CHANDRA P KHATTAK
TITLE:
GROWTH OF KTP CRYSTALS FOR NON-LINEAR OPTICAL APPLICATIONS
TOPIC# 116 OFFICE: AFWAL/ASD IDENT#: 26950

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THE PROPOSED PROGRAM IS TO SHOW FEASIBILITY OF GROWING KTiOPO(4) CRYSTALS FROM FLUX USING THE HEAT EXCHANGER METHOD (HEM[TM]). THE NON-LINEAR OPTICAL COEFFICIENTS OF KTP ARE COMPARABLE TO Ba(2)NaNb(5)O(15) (BSN), AN OUTSTANDING MATERIAL FOR SECOND HARMONIC GENERATION OF 0.53 um RADIATION FROM 1.06 MICROMETER LASER RADIATION. SMALL KTP CRYSTALS OF UP TO 125 mm(3) HAVE BEEN GROWN BY THE HYDRO-THERMAL TECHNIQUE; FOR LARGER SIZES, NEW COLD WALL AUTOCLAVES NEED TO BE DESIGNED AND FABRICATED. THE MAIN PROBLEM ENCOUNTERED WITH KTP GROWTH FROM FLUX SO FAR HAS BEEN SPONTANEOUS NUCLEATION WHICH HAS PREVENTED GROWTH OF LARGE CRYSTALS. IN HEM THE TEMPERATURE GRADIENTS IN THE SOLID AND LIQUID CAN BE CONTROLLED SUCH THAT THE INITIAL NUCLEATION CAN BE CONTROLLED AND SPURIOUS NUCLEATION FROM THE CRUCIBLE WALLS CAN BE PREVENTED DURING THE CRYSTAL GROWTH CYCLE. INITIAL EXPERIMENTS WILL BE CARRIED OUT WITH UNSEEDED GROWTH, AND, THEREAFTER, IT IS INTENDED TO UTILIZE SEEDED GROWTH EXPERIMENTS. THE CRYSTALS WILL BE EXAMINED FOR MORPHOLOGY, FLUX INCLUSIONS, CLARITY, COMPOSITION AND OPTICAL TRANSMISSION.

CRYSTALLUME
3180 PORTER DR - STE 2
PALO ALTO, CA 94304
CONTRACT NUMBER:
DR K V RAVI
TITLE:
CVD DIAMOND PACKAGING SYSTEMS FOR HIGH TEMPERATURE ELECTRONICS
TOPIC# 127 OFFICE: AFWAL/ASD IDENT#: 26968

THE OBJECTIVE OF THIS RESEARCH IS TO DETERMINE THE FEASIBILITY OF EMPLOYING DIAMOND FILM TO IMPROVE THE THERMAL CONDUCTIVITY OF SOME COMMONLY USED ELECTRONIC PACKAGING MATERIALS AND TO RELATE FILM MICROSTRUCTURE TO THERMAL CONDUCTIVITY. TO ACHIEVE THIS OBJECTIVE WE WILL CORRELATE THE CONDITIONS OF THIN FILM DIAMOND SYNTHESIS BY PE-CVD WITH THE RESULTING AS-DEPOSITED MICROSTRUCTURE. THE THERMAL PROPERTIES OF THE FILMS WILL BE CHARACTERIZED TO DETERMINE THE DEGREE TO WHICH THERMAL CONDUCTIVITY IS AFFECTED BY DEPOSITION PARAMETERS AND SUBSTRATE MATERIAL. THE FACTORS THAT GOVERN THE ADHESION BE-TWEEN THE DIAMOND AND SUBSTRATE MATERIALS WILL ALSO BE INVESTIGATED. CHARACTERIZATION DATA WILL BE COMPARED TO DEPOSITION PARAMETERS AND

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SUBSTRATE MATERIAL TO DETERMINE WHICH PARAMETERS MOST STRONGLY GOVERN THERMAL CONDUCTIVITY IN CVD DIAMOND THIN FILMS, SUPPORTING A PREDICTIVE MODEL OF DIAMOND DEPOSITION PARAMETERS AND RESULTING PHYSICAL PROPERTIES. AT THE CONCLUSION OF THE PROJECT A NUMBER OF DIAMOND SAMPLES WILL BE MADE AVAILABLE TO OUTSIDE ORGANIZATIONS FOR PERFORMANCE TESTING, PAVING THE WAY FOR SPECIFIC APPLICATIONS ENGINEERING IN A PHASE II SBIR PROJECT.

CRYSTALLUME
3180 PORTER DR - STE 2
PALO ALTO, CA 94304
CONTRACT NUMBER:
DR K V RAVI
TITLE:
OXIDATION RESISTANT DIAMOND COATINGS FOR HIGH TEMPERATURE IHPTET APPLICATIONS
TOPIC# 128 OFFICE: AFWAL/ASD IDENT#: 26969

DIAMOND THIN FILMS ARE EXPECTED TO PROVIDE SIGNIFICANT BENEFITS FOR APPLICATIONS IN DIFFICULT ENVIRONMENTS. HOWEVER, AN ANTICIPATED LIMITATION ON THE USE OF DIAMOND THIN FILMS IN AIR IS THE ONSET OF OXIDATION AT TEMPERATURES IN EXCESS OF APPROXIMATELY 550 DEG C. THE RESEARCH CONTEMPLATED WOULD TAKE THE FIRST STEPS NECESSARY TO DEVELOP COATINGS TO INHIBIT OXIDATION OF DIAMOND THIN FILMS. THE CONTRACTOR WILL IDENTIFY MATERIALS WHICH CAN SERVE AS EFFECTIVE OXIDATION CARRIERS FOR DIAMOND FILMS, AND DETERMINE THE RELATIVE EXTENT OF OXIDATION PROTECTION. RESEARCH WILL CONSIST OF TWO MAJOR ACTIVITIES. FIRST WOULD BE INVESTIGATION OF OXIDATION OF UNPROTECTED DIAMOND THIN FILMS IN AIR. THE SECOND ACTIVITY WOULD BE DEPOSITION OF VARIOUS MATERIALS ON DIAMOND FILMS AND SUBSEQUENT EVALUATION OF OXIDATION RESISTANCE. COATING MATERIAL ADHESION TO DIAMOND WILL ALSO BE INVESTIGATED TO HELP ASSURE STRONG CONFORMAL COATINGS. CHARACTERIZATION DATA WILL BE CORRELATED WITH DEPOSITION PARAMETERS AND COATING MATERIALS TO DETERMINE WHICH COMBINATIONS MOST STRONGLY GOVERN RESISTANCE TO OXYGEN ATTACK. AT THE CONCLUSION OF THE PROJECT A NUMBER OF DIAMOND SAMPLES WILL BE MADE AVAILABLE TO OUTSIDE ORGANIZATIONS FOR ADDITIONAL TESTING, PAVING THE WAY FOR SPECIFIC APPLICATIONS ENGINEERING IN A PHASE II SBIR PROJECT.

DAINA
4960 FILLMORE ST NE
COLUMBIA HEIGHTS, MN 55421
CONTRACT NUMBER:
JANIS PUKITE
TITLE:
MISSION RELIABILITY MODEL (MIREM) ENGINEERING WORKSTATION
TOPIC# 70 OFFICE: AFHRL/HSD IDENT#: 26884

SUBMITTED BY

THE COMPLEXITY OF THE NEXT-GENERATION FAULT-TOLERANT ELECTRONIC SYSTEM DESIGN TASKS WILL REQUIRE INTERACTIVE ACCESS TO THE RELIABILITY PREDICTION TOOLS IN ORDER TO ACHIEVE THE DESIRED RELIABILITY GOALS. THIS PROPOSAL ADDRESSES THE INTEGRATION OF THE AFHRL DEVELOPED MISSION RELIABILITY MODEL (MIREM) AND THE AVAILABLE CIRCUIT DESIGN PROGRAMS IN AN ENGINEERING WORKSTATION ENVIRONMENT. THE PROPOSED EFFORT INCLUDES THE DETERMINATION OF THE DESIGN-PHASE RELIABILITY PREDICTION AND ENGINEERING WORKSTATION FUNCTIONAL REQUIREMENTS, NEEDED MIREM EXTENSIONS, EVALUATION OF THE INTERFACING METHODS, AND A FEASIBILITY/RISK ASSESSMENT. THE PROPOSED APPROACH, BASED ON THE ELECTRONIC DESIGN DATA INTERCHANGE CONCEPT, WILL SIMPLIFY THE MIREM INTEGRATION TASK AND WILL MAKE MIREM AVAILABLE ON A MULTITUDE OF ENGINEERING WORKSTATIONS.

DAINA
4960 FILLMORE ST NE
COLUMBIA HEIGHTS, MN 55421
CONTRACT NUMBER:
JANIS PUKITE
TITLE:
FAIL-SAFE FAULT-TOLERANT ELECTRONICS
TOPIC# 75 OFFICE: AFWAL/ASD IDENT#: 26891

FUTURE MILITARY AVIONICS SYSTEMS WILL REQUIRE AT LEAST AN ORDER OF MAGNITUDE IMPROVEMENT IN MEAN TIME BETWEEN CRITICAL FAILURES. TO ACHIEVE THIS GOAL INNOVATIVE FAIL-SAFE FAULT-TOLERANT ELECTRONIC SYSTEM DESIGN CONCEPTS WILL BE NEEDED. THE APPROACH PROPOSED BY DAINA WILL BE BASED ON THE USE OF EXTERNAL ENVIRONMENT DATA, BUILT-IN RELIABILITY MODEL, ADAPTIVE STATISTICAL SYSTEM STATE AND PARAMETER ESTIMATORS, SOFTWARE HOOKS, SIGNAL FUSION, AND APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNIQUES. IT IS EXPECTED THAT BY MAXIMIZING THE UTILIZATION OF THE AVAILABLE INFORMATION MORE RELIABLE FAULT DETECTION AND ISOLATION WILL BE ACHIEVED, RELIABILITY IMPROVED, AND FALSE ALARM RATE DECREASED, ALLOWING THE AIRCRAFT TO CONTINUE MISSION EVEN AFTER EXPERIENCING HARDWARE OR SOFTWARE FAILURES OR COMBAT DAMAGE. IMPROVEMENT IN FAULT-TOLERANT SYSTEM DESIGN AIDS WILL BE RECOMMENDED TO SUPPORT RELIABILITY AND SAFETY EVALUATION OF THE PROPOSED DESIGNS. PHASE I OF THIS EFFORT WILL INCLUDE AN ASSESSMENT OF AVIONICS SYSTEM

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REQUIREMENTS, IDENTIFICATION OF HIGH-PAYOFF HARDWARE AND SOFTWARE TECHNOLOGIES, EVALUATION OF REDUNDANCY AND RECONFIGURATION IMPLEMENTATION, AND DETERMINATION OF COMPUTER-AIDED DESIGN SUPPORT TOOL NEEDS. PHASE II WILL INVOLVE A PROTOTYPE DEVELOPMENT OF THE SELECTED FAIL-SAFE FAULT-TOLERANT ELECTRONICS AND THE SUPPORTING TECHNOLOGY NEEDS.

DAMASKOS INC
PO BOX 469
CONCORDVILLE, PA 19331
CONTRACT NUMBER:
GERARD J MATYAS
TITLE:
A DUAL POLARIZED C-BAND ANTENNA
TOPIC# 195 OFFICE: BMO/MYSC IDENT#: 28608

A BROADBAND (~1 OCTAVE) DUAL POLARIZED FLUSH MOUNT ANTENNA WITH LOW RCS WILL BE DEVELOPED. THE ANTENNA WILL BE CENTERED IN C-BAND WITH AT LEAST OdBi OF GAIN WITH A SIMULATED CERAMIC HEATSHIELD INSTALLED. THE ELEMENT WILL BE DESIGNED TO HAVE AN OMNI-DIRECTIONAL RADIATION PATTERN TO ALLOW IT TO BE INTEGRATED INTO A WIDE VARIETY OF ELECTRONIC SYSTEMS. PHASE II WILL ADDRESS THE ANTENNAS ABILITY TO WITH STAND AERO-THERMAL LOADS AS WELL AS DEVELOP A HEATSHIELD WITH SUITABLE RF AND PHYSICAL PROPERTIES. THE ANTENNA WILL BE MODIFIED TO OPERATE IN OTHER FREQUENCY RANGES AS WELL.

DAYCHEM LABS INC
1600 N BROAD ST
FAIRBORN, OH 45324
CONTRACT NUMBER:
RAKESH K GUPTA
TITLE:
MODIFICATION OF PBY POLYMER BACKBONE
TOPIC# 110 OFFICE: AFWAL/ASD IDENT#: 26941

A METHOD IS PROPOSED BY WHICH THE HIGH PERFORMANCE PBX TYPE OF POLYMER MAY BE MODIFIED TO EFFECT AN IMPROVEMENT IN THE PROCESS-

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ABILITY OF THESE POLYMERS FOR FIBER FILM AND MATRIX RESIN APPLICATIONS. THE METHOD IS DESIGNED TO IMPROVE THE SOLUBILITY. A SECOND POTENTIAL GAIN IS THE POSSIBILITY OF EFFECTING A STABLE, CROSSLINKING BONDING BETWEEN POLYMER CHAINS UNDER ELEVATED CURE CONDITIONS. PHASE I RESEARCH WILL ASSESS THE FEASIBILITY OF THE PROPOSED MODIFICATION. IF SUCCESSFUL, THE PROPOSED RESEARCH WILL ALSO PROVIDE A PRELIMINARY IDEA OF HOW THE PROCESSING AND PERFORMANCE PROPERTIES OF PBX POLYMER SYSTEMS ARE AFFECTED BY THIS MODIFICATION.

DEACON RESEARCH
900 WELCH RD - STE 203
PALO ALTO, CA 94304
CONTRACT NUMBER: F49620-88-C-0099
ANTHONY O'KEEFE
TITLE:
DEVELOPMENT OF PHOTO - DEPOSITED DIAMOND FILMS
TOPIC# 234 OFFICE: AFOSR/NC IDENT#: 28662

ADVANCED IN THE GROWTH OF SYNTHETIC DIAMOND FILMS ARE BEGINNING TO MAKE IT POSSIBLE TO USE THIS EXOTIC MATERIAL FOR NEW APPLICATIONS IN ELECTRONICS, OPTICS, AND MICROSTRUCTURES, HOWEVER, THE PRESENT TECHNOLOGY IS SLOW AND PRODUCES NONUNIFORM FILMS WITH GRAPHIC INCLUSIONS. SIGNIFICANT IMPROVEMENT IN THE CONTROL OF DEPOSITION PURITY AND FILM GROWTH RATE WILL BE NECESSARY BEFORE THIS MATERIAL IS SUITABLE FOR SOME OF ITS PROJECTED AND APPLICATIONS. WE BELIEVE AN APPROACH UTILIZING SELECTIVE LASER PRODUCTION OF THE METHYL RADICAL, BELIEVED TO BE THE BASIC BUILDING BLOCK OF THE DIAMOND FILM, WILL RESULT IN A FILM PURITY UNMATCHED BY OTHER METHODS. WE PROPOSE A SIX MONTH PHASE I EFFORT TO DEMONSTRATE THIS TECHNIQUE EXPERIMENTALLY AND VERIFY THE RESULTING FILM GROWTH RATE AND PURITY. IN A PHASE II PROGRAM, WE WOULD DETERMINE THE DEPENDENCE OF THE FILM GROWTH ON PROCESS CONDITIONS AND OPTIMIZE THE TECHNIQUE.

DECISION SCIENCE CONSORTIUM INC
1895 PRESTON WHITE DR - STE 300
RESTON, VA 22091
CONTRACT NUMBER:
JOHN LEDDO
TITLE:
AN AUTOMATED TRAINING SYSTEM FOR BUILDING EXPERTISE
TOPIC# 63 OFFICE: AFHRL/HSD IDENT#: 26864

SUBMITTED BY

COMPUTER-BASED TUTORIAL SYSTEMS HAVE NOW BECOME EFFECTIVE TRAINERS IN A NUMBER OF DOMAINS. MANY GOOD SYSTEMS ARE MODELED AFTER THEORIES OF HUMAN LEARNING AND KNOWLEDGE REPRESENTATION. HOWEVER, SUCH SYSTEMS TYPICALLY ASSUME A LIMITED VIEW OF HUMAN KNOWLEDGE, HENCE LIMITING THEIR APPLICABILITY TO INTRODUCTORY LEVEL MATERIAL. RESEARCH BY THE PROPOSED PROJECT TEAM HAS SHOWN THAT EXPERTS HAVE A BROAD RANGE OF KNOWLEDGE STRUCTURES. ANY TRAINING SYSTEM (COMPUTER OR OTHER) ATTEMPTING TO BUILD STUDENT'S EXPERTISE SHOULD GUIDE ITS INSTRUCTION ACCORDING TO HOW EXPERTS REPRESENT AND USE KNOWLEDGE. WE PROPOSE TO BUILD A COMPUTER-BASED TRAINING SYSTEM AND OVERALL TRAINING METHODOLOGY THAT HELPS STUDENTS INTEGRATE A WIDE RANGE OF KNOWLEDGE (E.G., PLANNING, CAUSAL REASONING, CONCEPT FAMILIARITY) AND APPLY IT TO PRACTICAL PROBLEMS. IN ADDITION, WE PROPOSE TO USE KNOWLEDGE ELICITATION TECHNIQUES DEVELOPED BY THE PROPOSED PROJECT TEAM TO EVALUATE THE EFFECTIVENESS OF TRAINING AND GUIDE CORRECTIVE INSTRUCTION.

DECISION SCIENCE CONSORTIUM INC
1895 PRESTON WHITE DR - STE 300
RESTON, VA 22091
CONTRACT NUMBER:
MARTIN A TOLCOTT
TITLE:
USER INTERACTION WITH SELF-LEARNING SYSTEMS
TOPIC# 65 OFFICE: AAMRL/HSD IDENT#: 26879

MILITARY INTEREST IN ARTIFICIAL INTELLIGENCE (AI) AND EXPERT SYSTEMS IS GROWING IN RESPONSE TO NEEDS FOR REDUCTING MANPOWER-INTENSIVE TASKS AND PROVIDING AID TO DECISION MAKERS WHOSE INFORMATION-PROCESSING CAPABILILTIES ARE BEING OVERTAXED. THE CUTTING EDGE OF RESEARCH ON EXPERT SYSTEMS CONCERNS SELF-LEARNING SYSTEMS, NAMELY, SYSTEMS WHOSE KNOWLEDGE BASES AND PROCESSING LOGIC CAN CHANGE IN RESPONSE TO USER COMMANDS OR EXTERNAL DEMANDS. TO ENSURE EFFECTIVE COOPERATIVE PROBLEM SOLVING, USERS OF ADAPTIVE SYSTEMS MAY HAVE TO BE INFORMED OF CHANGES INTERNAL TO SUCH SYSTEMS, THROUGH A DYNAMIC INTERFACE WHICH IS EASY TO COMPREHEND. IT IS PROPOSED TO INVESTIGATE HOW ADVANCES IN THEORIES OF COGNITIVE SCIENCE AND MENTAL MODELS CAN INCREASE OUR UNDERSTANDING OF USER INFORMATION NEEDS AND GUIDE THE

SUBMITTED BY

DESIGN OF USER INTERFACES WITH SELF-LEARNING SYSTEMS, IN THE FACE OF THE CHANGING BASES FOR THE SYSTEMS' RESPONSES. THREE TASKS ARE PROPOSED FOR PHASE I: (1) EXTEND THEORIES OF KNOWLEDGEMENT REPRESENTATION AND MENTAL MODELS TO DETERMINE USER INFORMATION NEEDS WHEN WORKING WITH SELF-LEARNING AI SYSTEMS; (2) DEVELOP NEW DESIGN CONCEPTS FOR SELF-LEARNING SYSTEMS, TO INCORPORATE NEEDED USER INTERFACES; (3) DETERMINE THE FEASIBILITY OF DYNAMIC ON-LINE DISPLAYS AND RELATED INTERACTIVE TECHNIQUES EMBODYING THESE CONCEPTS.

DECISION SYSTEMS INC
3883 - N 100RD E
PROVO, UT 84604
CONTRACT NUMBER:
ALAN R PARKINSON
TITLE:
AUTOMATED MECHANICAL DESIGN BASED ON OPTIMIZATION DECOMPOSITION AND FEATURE-BASED MODELING
TOPIC# 119 OFFICE: AFWAL/ASD IDENT#: 26955

THE DEVELOPMENT OF A PROTOTYPE SOFTWARE PACKAGE FOR USE IN THE DESIGN OF AN EXAMPLE MECHANICAL PART IS PROPOSED. THE PACKAGE WILL DEMONSTRATE THE FEASIBILITY OF LATER DEVELOPING A GENERAL SOFTWARE PACKAGE FOR THE DESIGN OF MECHANICAL PARTS. THE PACKAGE DECOMPOSES THE DESIGN INTO SYSTEM AND COMPONENT LEVELS. AT EACH LEVEL AN EXPERT SYSTEM/FEATURE-BASED MODELING SOFTWARE PACKAGE ASSISTS WITH CONCEPTUAL DESIGN, WHILE QUANTITATIVE DESIGN IS TREATED WITH STATE-OF-THE-ART OPTIMIZATION SOFTWARE.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER:
DR PHILIP TOMLINSON
TITLE:
SIDELOBE REDUCTION AND CLUTTER SUPPRESSION FOR A DSAR SYSTEM
TOPIC# 166 OFFICE: AFSD IDENT#: 27106

ONE OF THE ISSUES WHICH CONTINUE TO CONCERN PLANNERS AND THE

SUBMITTED BY

DESIGNERS OF FUTURE RADAR SYSTEMS IS THE SIDELOBES OF THE DISTRIBUTED SPARSE ARRAY RADAR (DSAR). AS A GENERAL RULE, PERFORMANCE IN BOTH CLUTTER AND JAMMING TENDS TO DEGRADE AS SIDELOBE LEVELS INCREASE. FURTHERMORE, IN ORDER TO MAKE USE OF THE HIGH RESOLUTION POTENTIAL OF DSAR FOR IMAGING, RAID COUNT, OR VERY ACCURATE TARGET LOCATION, THE ARRAY SIDELOBES MUST BE CONTROLLED. THE TECHNICAL OBJECTIVE OF THE PHASE I EFFORT IS TO DEFINE AND ANALYZE INNOVATIVE APPROACHES FOR THE REDUCTION OF DSAR SIDELOBES AND FOR SUPPRESSING CLUTTER RETURNS WHICH ARISE FROM THE RESIDUAL SIDELOBES. TECHNIQUES SUCH AS OPTIMAL SPACE-TIME PROCESSING, MAXIMUM LIKELIHOOD PROCESSING AND CLEAN ALGORITHMS WILL BE EVALUATED.

DIGITAL DISPATCH INC (DDI)
1580 RICE CREEK RD
FRIDLEY, MN 55432
CONTRACT NUMBER:
STEPHEN H BOGGS
TITLE:
DECREASEING THE COST AND INCREASING THE PERFORMANCE OF COMPUTER-BASED TRAINING SIMULATIONS
TOPIC# 63 OFFICE: AFHRL/HSD IDENT#: 26868

CURRENTLY AVAILABLE AUTHORING SYSTEMS HAVE BEEN PROVEN EFFECTIVE IN PRODUCING COMPUTER-BASED TRAINING LESSONS CONTAINING SEQUENCES OF TEXT AND GRAPHICS SCREENS THROUGH WHICH THE STUDENT IS GUIDED UNTIL MASTERY IS ACHIEVED. IN A PERSONNEL TRAINING SIMULATION, FAR MORE ADVANCED CAPABILITIES ARE REQUIRED, INCLUDING MULTITASKING, COMMUNICATION WITH EXTERNAL DEVICES, HIGH SPEED DATA ANALYSIS AND GRAPHICS SCREEN UPDATING, AND THE MONITORING OR INITIATION OF REAL-TIME EVENTS. THE EFFICIENCIES OF EXISTING AUTHORING SYSTEMS AND PROGRAMMING LANGUAGES ARE LOST WHEN A HIGHLY SKILLED PROGRAMMER MUST DEVELOP THESE CAPABILITIES AT A LOW SYSTEM LEVEL. THIS PROJECT WILL DETERMINE THE CAPABILITIES MOST NEEDED BY SIMULATION PROGRAMS, CREATE A PROTOTYPE SOFTWARE SYSTEM THAT SUPPORTS THESE CAPABILITIES, AND PERFORM TESTING TO DETERMINE THEIR EFFECTIVENESS. THIS RESEARCH CAN BE USED TO DEVELOP THE PROTOTYPE PRODUCT INTO A COMMERCIALLY VIABLE AUTHORING SYSTEM THAT ALLOWS A PROGRAMMER WITH SIX MONTHS TO ONE YEAR EXPERIENCE TO DEVELOP SOPHISTICATED COMPUTER-BASED SIMULATIONS IN A HIGHLY EFFICIENT AND COST EFFECTIVE MANNER.

SUBMITTED BY

DISPLAYTECH INC
2200 CENTRAL AVE
BOULDER, CO 80301
CONTRACT NUMBER:
MARK HANDSCHY
TITLE:
FOUR WAVEMIXING WITH FERROELECTRIC LIQUID CRYSTAL SPATIAL LIGHT MODULATORS
TOPIC# 182 OFFICE: AFWL/PRC IDENT#: 27132

FERROELECTRIC LIQUID CRYSTALS (FLCs) EXHIBIT LOW VOLTAGE, LOW POWER ELECTRO-OPTIC SWITCHING WITH VERY FAST (MICROSECOND) RESPONSE AND HIGH OPTICAL EFFICIENCY. THESE CHARACTERISTICS MAKE POSSIBLE THE APPLICATION OF FLCs IN COMBINATION WITH A HYDROGENATED AMORPHOUS SILICON (aSi:H) PHOTOSENSING LAYERS TO MAKE OPTICALLY ADDRESSED SPATIAL LIGHT MODULATORS CAPABLE OF FOUR WAVEMIXING, PHASE CONJUGATION, AND OTHER NONLINEAR OPTICAL OPERATIONS. THE PROPOSED WORK WILL DEVELOP FLC, aSi:H, AND CELL COMPONENT MATERIALS FOR THIS APPLICATION.

DISPLAYTECH INC
2200 CENTRAL AVE
BOULDER, CO 80301
CONTRACT NUMBER:
MARK HANDSCHY
TITLE:
MATERIALS FOR FERROELECTRIC LIQUID CRYSTAL OPTICALLY ADDRESSED SPATIAL LIGHT MODULATORS
TOPIC# 49 OFFICE: RADC/XPX IDENT#: 28575

FERROELECTRIC LIQUID CRYSTALS (FLCs) EXHIBIT LOW VOLTAGE, LOW POWER ELECTRO-OPTIC SWITCHING WITH VERY FAST (MICROSECOND) RESPONSE AND HIGH OPTICAL EFFICIENCY. THESE CHARACTERISTICS MAKE POSSIBLE THE APPLICATION OF FLCs IN COMBINATION WITH A HYDROGENATED AMORPHOUS SILICON (aSi:H) PHOTOSENSING LAYERS TO MAKE OPTICALLY ADDRESSED SPATIAL LIGHT MODULATORS. THE PROPOSED WORK WILL DEVELOP FLC,

SUBMITTED BY

aSi:H, AND CELL COMPONENT MATERIALS FOR THIS APPLICATION.

DOWLAND-BACH CORP
PO BOX 230126
ANCHORAGE, AK 99523
CONTRACT NUMBER:
SCOTT SELFRIDGE
TITLE:
FULLY AUTOMATIC CALIBRATION SYSTEM
TOPIC# 147 OFFICE: AFWAL/ASD IDENT#: 27006

IT IS OUR INTENT TO PROVIDE A FULLY AUTOMATED, PORTABLE, SELF-CONTAINED NBS TRACEABLE CALIBRATION SYSTEM THAT WOULD ALLOW FOR THE VERIFIED CALIBRATION OF PRESSURE TRANSMITTERS, PRESSURE TRANSDUCERS, GAUGES, PRESSURE SWITCHES, AND OTHER PRESSURE INSTRUMENTS FROM VACUUM TO 10,000 PSIG. THIS INCLUDES THE NEW 'INTELLIGENT' PRESSURE TRANSMITTERS. ADDITIONALLY, THIS SYSTEM SHOULD HAVE AN ACCURACY OF +/- 0.017% OF READING (WORST CASE), WITH A TYPICAL ACCURACY OF +/- 0.013% OF ANY READING FROM VACUUM TO 10,000 PSIG. IT IS ENVISIONED THAT ALL CALIBRATION DATA ON ANY INSTRUMENT TESTED COULD BE STORED FOR LATER RECALL AND THAT A HISTORY OF THE INSTRUMENT TESTED WOULD BE AUTOMATICALLY UPDATED WITH EACH CALIBRATION. FINALLY, IT IS ENVISIONED THAT A PRINT-OUT OF THE CALIBRATION DATA, INCLUDING A GRAPH, BE PROVIDED AT THE END OF EACH CALIBRATION PROCEDURE.

DUFFY ENGINEERING
7 NASHAWENA RD
MASHPEE, MA 02649
CONTRACT NUMBER:
WILLIAM F DUFFY
TITLE:
VIDEOWARE AUTHORING SYSTEM
TOPIC# 63 OFFICE: AFHRL/HSD IDENT#: 26867

THE SYSTEM PROPOSED OFFERS A UNIQUE METHOD OF INSTRUCTION AND TESTING THROUGH THE USE OF VIDEO TECHNOLOGY. SPECIFIC TO THIS SYSTEM IS A

SUBMITTED BY

SIMPLIFIED VIDEOTAPE AUTHORING TECHNIQUE. THE INTENT IS TO PROVIDE AN EDITING PROCESS THAT IS SIMPLE ENOUGH FOR MOST INSTRUCTORS AND/OR AUTHORS TO PREPARE THEIR OWN MATERIAL USING A VIDEO CAMERA. ONCE THE VIDEOTAPE IS EDITED, THE COMPILING INTO A USABLE FORMAT IS AUTOMATED. INEXPENSIVE AND READILY-AVAILABLE VIDEO COMPONENTS AND PERSONAL COMPUTERS WILL BE REQUIRED FOR EDITING AND ANY VCR AND PC WILL BE REQUIRED FOR OUTPUT. THE FORMAT OF THE PROPOSED EFFORT IS UNIQUE.

DUNCAN TECHNOLOGIES INC
PO BOX 1150
NEWCASTLE, CA 95658
CONTRACT NUMBER:
DAVID B DUNCAN
TITLE:
SMALL CRATER BRIDGING MATERIAL
TOPIC# 59 OFFICE: AFESC/RDXP IDENT#: 23221

DUNCAN TECHNOLOGIES PROPOSES TO DEVELOP A LIGHTWEIGHT RUNWAY REPAIR SYSTEM FOR RAPID RESPONSE TO BOMB CRATER DAMAGE OF EITHER CONCRETE OR ASPHALT SURFACE RUNWAYS. THE PROPOSED RUNWAY REPAIR SYSTEM CONSISTS OF TWO SHEETS OF FIBER COMPOSITE BONDED TOGETHER AT THE EDGES. THE ASSEMBLY OF TWO SHEETS IS PLACED OVER THE CRATER AND ANCHORED AROUND THE PERIMETER. RAPID SETTING FOAM IS INJECTED BE-TWEEN THE SHEETS FORMING A RIGID LAMINATE STRUCTURE.

DYNA EAST CORP
3201 ARCH ST - 3RD FL
PHILADELPHIA, PA 19104
CONTRACT NUMBER:
ROBERT D CICCARELLI
TITLE:
DEVELOPMENT OF MULTI-FORMATION MODE SFF WARHEAD FOR ENHANCED ARMOR LETHALITY
TOPIC# 1 OFFICE: AD/PMR IDENT#: 30992

CURRENT TOP-ATTACK ANTI-ARMOR MUNITIONS CONTAINING SELF-FORGING-

SUBMITTED BY

FRAGMENT (SFF) WARHEADS ARE DEDICATED DESIGNS THAT ARE INTENDED TO DEFEAT A SPECIFIC TYPE OF TARGET AND ARE GENERALLY LESS EFFECTIVE AGAINST OTHER TARGETS. THUS ONE TYPE OF WARHEAD DESIGN IS PRESENTLY USED AGAINST HARD TARGETS, SUCH AS TANKS, AND A DIFFERENT TYPE IS USED AGAINST SOFT TARGETS, SUCH AS ARMORED PERSONNEL CARRIERS OR TRUCKS. OUR PROPOSAL IS A NOVEL SOLUTION TO THIS PROBLEM WHICH WILL ENABLE A SINGLE WARHEAD, AND THEREFORE A SINGLE MUNITION, TO BE EFFECTIVE AGAINST A FULL RANGE OF TARGETS. THIS WILL BE ACCOMPLISHED BY FIRING A SINGLE WARHEAD IN DIFFERENT MODES AGAINST DIFFERENT TARGETS, POSSIBLY DEPENDENT ALSO ON STANDOFF. RECENT DEVELOPMENTS IN FUSING AND SENSOR TECHNOLOGY WILL PERMIT THE MUNITION TO ASSESS THE TYPE OF TARGET BEING ENGAGED AND ITS STANDOFF, AND TO SELECT THE APPROPRIATE FIRING MODE. BY GENERATING THE OPTIMUM PENETRATING SFF FOR EACH POSSIBLE TARGET-STANDOFF COMBINATION, LETHALITY IS INCREASED AND BEHIND ARMOR EFFECTS ARE MAXIMIZED. THE PROPOSED STUDY WILL 1) FURTHER DEVELOP AND EXPERIMENTALLY DEMONSTRATE THE FEASIBILITY OF THIS NEW CONCEPT AND 2) ANALYZE THE INCREASE IN LETHALITY THAT THIS APPROACH SHOULD YIELD.

DYNA EAST CORP
3201 ARCH ST - 3RD FL
PHILADELPHIA, PA 19104
CONTRACT NUMBER:
ROBERT D CICCARELLI
TITLE:
HEAVY-METAL SELF-FORGING-FRAGMENT WARHEAD DEVELOPMENT
TOPIC# 1 OFFICE: AD/PMR IDENT#: 30993

THE INCREASED EFFECTIVENESS OF MODERN ADVANCED ARMORS HAS CALLED FOR MORE PERFORMANCE FROM EXISTING CONVENTIONAL WARHEADS. ONE WAY TO ADDRESS THIS CHALLENGE IS THROUGH THE USE OF HIGH-DENSITY MATERIALS AS SELF-FORGING FRAGMENT (SFF) LINERS. THE BENEFIT OF SUCH MATERIALS IS INCREASED PENETRATION INTO THE TARGET. SEVERAL HIGH-DENSITY METALS INCLUDING TANTALUM (ρ = 16.6 g/cc), DEPLETED URANIUM (DU) (ρ = 19.1 g/cc), AND TUNGSTEN (ρ = 19.3 g/cc) HAVE BEEN TRIED IN THIS APPLICATION, BUT TUNGSTEN HAS A NUMBER OF ADVANTAGES. TUNGSTEN HAS A VERY HIGH DENSITY AND IS NON-RADIOLOGICAL AND NON-TOXIC. RECENT WORK HAS SHOWN THAT IT IS POSSIBLE TO PROCESS TUNGSTEN IN A COLD-FORGING OPERATION, WHICH IS QUITE ATTRACTIVE FROM A PRODUCTION

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STANDPOINT. PRELIMINARY APPLICATION TO SHAPE-CHARGE LINERS HAS ALSO SHOWN SATISFACTORY RESULTS. THEREFORE, WE PROPOSE TO DEMONSTRATE THE FEASIBILITY OF USING TUNGSTEN, DERIVED FROM A PRODUCTION-TYPE PROCESS, IN AN SFF LINER.

DYNACS ENGINEERING CO
2280 US 19 N - STE 111
CLEARWATER, FL 34623
CONTRACT NUMBER:
DR ANREN HU
TITLE:
IDENTIFICATION TECHNIQUES FOR LARGE SPACE SYSTEMS
TOPIC# 169 OFFICE: AFAL IDENT#: 27112

THIS PROPOSAL SEEKS TO DEVELOP IDENTIFICATION ALGORITHMS FOR FLEXIBLE STRUCTURES IN SPACE WHERE PERFORMANCE SPECIFICATIONS ARE IN TERMS OF rms VALUES OF DEFLECTIONS AT MULTIPLE POINTS ON THE STRUCTURE (DERIVED FROM SHAPE OR POINTING CONTROL REQUIREMENTS). HENCE, COVARIANCE CONTROL OBJECTIVES ARE OF INTEREST IN SUCH PROBLEMS. THIS IDENTIFICATION PROPOSAL WILL DEVELOP ALGORITHMS TO PRODUCE MODELS OF ANY SPECIFIED ORDER r(q) FROM EXPERIMENTAL DATA TAKEN FROM THE STRUCTURE. THE MODEL WILL MATCH THE FIRST q DERIVATIVES OF BOTH THE IMPULSE RESPONSE MATRIX AND THE AUTOCORRELATION MATRIX IN THE VICINITY OF t=0, WHERE $r(q)<n(y)q$, AND n(y) IS THE NUMBER OF SENSORS FROM WHICH THE EXPERIMENTAL DATA IS TAKEN. THE IDENTIFICATION ALGORITHM WILL BE COMPATIBLE WITH CONTROL OBJECTIVES BECAUSE OF ITS CAPABILITY TO MATCH THE CONVARIANCE MATRIX THUS MAKING THESE DEPENDENT PROBLEMS (MODELING AND CONTROL) COMPATIBLE. THIS IS A REQUIRED RESULT BEFORE COMMERCIAL APPLICATIONS OF FLEXIBLE STRUCTURE CONTROL IN SPACE ARE FEASIBLE.

DYNAMET TECHNOLOGY INC
EIGHT 'A' ST
BURLINGTON, MA 01803
CONTRACT NUMBER:
STANLEY ABKOWITZ
TITLE:
THE QUALIFICATION OF AN ECONOMICALLY ADVANTAGEOUS Ti-6Al-4V BEARI HOUSING FOR HELICOPTER APPLICATION BY POWDER METAL MANUFACTURING
TOPIC# 154 OFFICE: AFWAL/ASD IDENT#: 27015

SUBMITTED BY

DYNAMET TECHNOLOGY HAS DEVELOPED A VERY ECONOMICALLY ADVANTAGEOUS POWDER METAL TECHNOLOGY FOR PRODUCTION OF TITANIUM ALLOY "NEAR NET" SHAPES. THIS TECHNOLOGY HAS RESULTED IN SIGNIFICANT COST SAVINGS IN THE PRODUCTION OF VARIOUS MISSILE COMPONENTS. THE APPLICATION OF THIS TECHNOLOGY TO MORE CRITICAL PROPULSION SYSTEM COMPONENTS WILL BE STUDIED UNDER THIS PROPOSED PROGRAM. A TITANIUM ALLOY BEARING HOUSING NEAR NET SHAPE COMPONENT HAS BEEN SELECTED BY DYNAMET AND TEXTRON/ LYCOMING AS THE TARGET COMPONENT. TEST BARS OF Ti-6Al-4V ALLOY PRODUCED USING TWO GRADES OF TITANIUM POWDER WILL BE FABRICATED. THE TEST BARS WILL BE MANUFACTURED USING COLD ISOSTATIC PRESSING, VACUUM SINTERING AND HOT ISOSTATIC PRESSING TO PRODUCE THE HIGH DENSITY TITANIUM ALLOY. THESE WILL BE TESTED AT DYNAMET AND TEXTRON/ LYCOMING. BASED ON THE RESULTING PROPERTIES, PREFORM SHAPES FOR THIS HOUSING WILL BE DESIGNED AND MANUFACTURED. THE P/M PREFORMS WILL BE SUPPLIED TO TEXTRON/LYCOMING FOR TEST AND EVALUATION. THE LYCOMING WORK WOULD BE CONTRIBUTED TO THE PROGRAM. IN ADDITION, ONE POWDER METAL NEAR SHAPE DEMONSTRATION PREFORM WILL BE SUPPLIED TO THE AIR FORCE.

DYNETICS INC
PO DRAWER B
HUNTSVILLE, AL 35814
CONTRACT NUMBER:
R L DUNKIN
TITLE:
MODEL FOR CHAFF RADAR RETURNS FOR MISSILE TARGET DETECTING DEVICE
TOPIC# 18 OFFICE: AD/PMR IDENT#: 23403

CURRENT AND FORECAST AIR FORCE MISSILE TEST PROGRAMS INVOLVE ATTACKS BY AIR-TO-AIR MISSILES ON DRONE AIRCRAFT THAT ARE DISPENSING SELF-DEFENSE RADAR CHAFF AS AN ELECTRONIC COUNTERMEASURE (ECM) TECHNIQUE. THE DELETERIOUS EFFECTS OF CHAFF ON MISSILE-BORNE RADAR SEEKERS HAVE BEEN INVESTIGATED AND ARE GENERALLY WELL UNDERSTOOD; HOWEVER, ITS SPECIFIC IMPACT ON MISSILE TARGET DETECTION DEVICES (TTDs) EMPLOYED DURING ENDGAME HAS NOT BEEN FULLY ADDRESSED. CONSEQUENTLY, A CRITICAL NEED EXISTS TO QUANTIFY THE EFFECTS OF SELF-DEFENSE RADAR CHAFF ON THE TDD FUNCTION OF THE MISSILE WARHEAD. DYNETICS PROPOSES TO DEVELOP A MODEL FOR CHAFF RADAR RETURNS FOR MISSILE TDD BY

SUBMITTED BY

FOLLOWING AN EFFICIENTLY ORGANIZED, PHASED APPROACH. THE FIRST PHASE, PHASE I, WILL PROVIDE A SOLID FOUNDATION FOR SUBSEQUENT PHASES BY DEFINING AND FULLY DOCUMENTING THE METHODOLOGY AND PROCEDURES FROM WHICH A COMPUTER MODEL CAN BE DEVELOPED FOR CREDIBLY SIMULATING CHAFF RADAR RETURNS. THIS SBIR PROPOSAL SPECIFICALLY ADDRESSES THE PHASE I EFFORT.

DYNETICS INC
PO DRAWER "B"
HUNTSVILLE, AL 35814
CONTRACT NUMBER:
DR M J BENDICKSON
TITLE:
ADAPTIVE CONTROL LAW DESIGN USING DISTURBANCE ACCOMMODATING TECHNIQUES
TOPIC# 100 OFFICE: AFWAL/ASD IDENT#: 26927

THE DESIGN OF FEEDBACK CONTROL LAWS FOR SYSTEMS WITH UNKNOWN PARAMETERS AND OTHER SIGNIFICIANT UNCERTAINTIES IS A FUNDAMENTAL PROBLEM IN THE AREA OF AEROSPACE VEHICLE CONTROL. THE APPLICATION OF DISTURBANCE ACCOMMODATING CONTROL (DAC) THEORY TO THIS AREA HAS RESULTED IN A REVOLUTIONARY APPROACH TO THE DESIGN OF ADAPTIVE CONTROL LAWS. THIS APPROACH HAS PROVEN TO BE EXTREMELY EFFECTIVE WHILE, AT THE SAME TIME, AVOIDING MANY OF THE DRAWBACKS ASSOCIATED WITH TRADITIONAL ADAPTIVE CONTROL TECHNIQUES SUCH AS SELF-TUNING REGULATORS AND MODEL REFERENCE-BASED CONTROLLERS.

E-TEK DYNAMICS INC
250 EAST DR
MELBOURNE, FL 32904
CONTRACT NUMBER:
J J PAN
TITLE:
DIODE ARRAY LASER RADAR
TOPIC# 89 OFFICE: AFWAL/ASD IDENT#: 26913

DIODE ARRAY LASER RADAR PROVIDES MANY ADVANTAGES INCLUDING SMALL

SUBMITTED BY

WEIGHT/SIZE, HIGH EFFICIENCY, FAST STEERING FOR MULTIPLE TARGETS DETECTION AND TRACKING, 0.1 METER RANGE RESOLUTION, AND EXCELLENT RELIABILITY. E-TEK HAS PREVIOUSLY INVESTIGATED, ANALYZED, COMPUTED, AND DESIGNED OPTICAL LASER PHASED-ARRAY TO DEMONSTRATE ITS FEASIBILITY, VALIDITY, AND VIABILITY. TO FURTHER OPTIMIZE THE PRACTICAL SYSTEM PERFORMANCE, POLARIZATION AND ENVIRONMENTAL EFFECTS SHALL BE MINIMIZED; SYSTEM/COMPONENTS/DEVICES, ISOLATION, BEAM FORMING, AND PACKAGING SHALL BE OPTIMIZED; AND SUBSYSTEM MODULARITY SHALL BE INVESTIGATED. THEREFORE, ALL PRACTICAL ISSUES COST EFFECTIVE PHASED-ARRAY LASER RADAR WILL BE INVESTIGATED, RESOLVED, AND OVERCOME. MULTIPLE TARGETS OF 10 TO THE 4TH POWER WITH DISTANCE OF 10 TO 3,000 Km, AND COVERAGE OF MORE THAN 20 DEGREES STERIAN ANGLE, WILL BE INCLUDED IN THE RADAR SYSTEM DESIGN. ACQUISITION TIME OF 1 ns AND POINTING/TRACKING ACCURARY OF BETTER THAN 0.5 uRAD ARE ALSO DESIGN GOALS.

E-TEK DYNAMICS INC
250 EAST DR
MELBOURNE, FL 32904
CONTRACT NUMBER:
J J PAN
TITLE:
OPTICAL SIGNAL DISTRIBUTION IN LARGE PHASED-ARRAY
TOPIC# 161 OFFICE: AFSD IDENT#: 27096

OPTICALLY BASED RF PHASE DISTRIBUTION AND CONTROL TECHNIQUES FOR MICROWAVE AND MILLIMETER-WAVE PHASED-ARRAY SYSTEMS PROVIDE THE ADVANTAGES OF COST EFFECTIVENESS, SYSTEM SIMPLICITY, RAPID PARALLEL PROCESSING, LOW INTERFERENCE, HIGH RADIATION RESISTANCE, AND EFFICIENT 3-D CONNECTIONS. E-TEK WOULD INVESTIGATE, ANALYZE, DESIGN, AND OPTIMIZE: (1) A PRECISE MICROWAVE RF PHASE TRANSMISSION AND DISTRIBUTION SYSTEM EMPLOYING AN INNOVATIVE FIBER OPTIC LINK, WITH PHASING ACCURACY OF + OR - 1 DEGREE; AND (2) VARIOUS OPTICAL BEAM FORMING/STEERING TECHNIQUES, INCLUDING OPTICAL CROSSBAR BEAM FORMER (BF), PARTIAL-SUM BF, VECTOR-MATRIX FREQUENCY DOMAIN BF, AND PROGRAMMABLE IMAGE/HOLOGRAPHIC BFs IN PHASE I. THE DETAILED DESIGNS OF THE COMPONENTS/DEVICES CAN DIRECTLY LEAD TO PHASE II HARDWARE FABRICATION, VERIFICATION, AND DEMONSTRATION. AT PRESENT, E-TEK HAS 21 GHz FIBER OPTIC LINK, PHASE SHIFTERS, LOW COST 1xN FIBER DISTRI-

SUBMITTED BY

BUTION COUPLER, INTEGRATED OPTIC SWITCH, ETC., TO PRACTICALLY IMPLEMENT THE OPTICALLY CONTROLLED PHASED-ARRAYS WITH ARRAY ELEMENTS OF 1,000 TO 10,000.

E-TEK DYNAMICS INC
250 EAST DR
MELBOURNE, FL 32904
CONTRACT NUMBER:
J J PAN
TITLE:
COHERENT SEMICONDUCTOR LASER ARRAYS
TOPIC# 180 OFFICE: AFWL/PRC IDENT#: 27129

COHERENT SEMICONDUCTOR LASER PHASED-ARRAYS PROVIDE ADVANTAGES OF RAPID BEAM STEERING COHERENT POWER COMBINING, BEAM SHARPENING, MICROWAVE MODULATION, MULTIPLE BEAMS/TRACKING, MONOLITHIC INTEGRATION, AND LONG LIFETIME. TO PRACTICALLY IMPLEMENT THE ARRAY SYSTEMS, E-TEK CAN OFFER VARIOUS REQUIRED TECHNOLOGIES AND COMPONENTS/DEVICES, SUCH AS OPTICAL PHASE SHIFTERS, 1xN DISTRIBUTION COUPLERS (N=38 EXISTS, N=200 IS UNDER DEVELOPMENT), AND FAR-FIELD PATTERNS COMPUTATION FOR LINEAR, PLANAR, AND CURVED LASER DIODE ARRAYS. DURING PAHSE I R&D, E-TEK WOULD IMPROVE OPTIC PHASE SHIFTER AND 1xN COUPLER PERFORMANCE, REDUCE MASTER LASER LINEWIDTH (IN KHz RANGE EMPLOYING A LOW COST LiNbO(3) PHASE MODULATOR), INVESTIGATE AND DESIGN THE INNOVATIVE FIBER OPTIC (OR INTEGRATED OPTIC) COMPATIBLE MINIATURE OPTICAL ISOLATORS (LOW COST AND MASS PRODUCIBLE) USING THIN FILM AND FARADAY PHASE ROTATION TECHNIQUES. THE DESIGNS OF ISOLATORS, PHASE SHIFTERS, LOW NOISE MASTER LASER, AND 1xN COUPLER WOULD DIRECTLY LEAD TO PHASE II HARDWARE FABRICATIONS, VERIFICATIONS, AND DEMONSTRATIONS.

EAGLE TECHNOLOGY INC
2300 - S 9TH ST/STE 400
ARLINGTON, VA 22204
CONTRACT NUMBER:
DR JAMES E DRISKELL
TITLE:
FUNCTIONAL DESIGN SPECIFICATIONS FOR SIMULATING THE STRESS ENVIRONMENT
TOPIC# 63 OFFICE: AFHRL/HSD IDENT#: 26865

SUBMITTED BY

RESEARCH FROM WORLD WAR II TO THE PRESENT INDICATES THAT THE STRESS OF COMBAT CONDITIONS IS A PRIMARY SOURCE OF TASK AND MISSION PERFORMANCE DECREMENT. YET, IT IS THE TRUE TEST OF MILITARY SYSTEMS AND PERSONNEL THAT THEY OPERATE EFFECTIVELY IN THIS STRESS ENVIRONMENT. ONE OPTIMAL INSTRUCTIONAL STRATEGY TO OVERCOME THIS DEGRADATION IS TO ALLOW TRAINING AND PRACTICE OF CRITICAL SKILLS UNDER THE STRESS OPERATIONAL CONDITIONS THAT PERSONNEL WILL BE FACED WITH. THIS STRATEGY CALLS FOR REALISTIC, HIGH FIDELITY SIMULATIONS, AND HAS BEEN SUCCESSFUL IN A VARIETY OF MILITARY APPLICATIONS. ALTHOUGH THE PHYSICAL FIDELITY OF A TRAINING SYSTEM CAN BE ATTAINED WITH GREAT PRECISION, THERE ARE NO DESIGN GUIDELINES AVAILABLE FOR EFFECTIVELY SIMULATING THE PSYCHOLOGICAL PROPERTIES OF THE STRESS ENVIRONMENT. THEREFORE, STRESS TRAINING, A CRITICAL COMPONENT OF EFFECTIVE MILITARY TRAINING, IS DESIGNED LARGELY ON INTUITIVE AND LESS THAN OPTIMAL GROUNDS. THIS PROJECT WILL RESEARCH AND DEVELOP THE PRIMARY FUNCTIONAL SPECIFICATIONS FOR AN EFFECTIVE STRESS SIMULATION. THIS DOCUMENT CAN BE USED IN FOLLOW-ON RESEARCH TO DESIGN EFFECTIVE TRAINING SCENARIOS AND OVERLAYS, TO DEVELOP REALISTIC RESEARCH SETTINGS FOR THE EXAMINATION OF STRESS EFFECTS, AND TO GUIDE EQUIPMENT DESIGN.

EAGLE TECHNOLOGY INC
2300 - S 9TH ST/STE 400
ARLINGTON, VA 22204
CONTRACT NUMBER:
DR JAMES E DRISKELL
TITLE:
A MICROCOMPUTER DECISION SUPPORT SYSTEM TO AID INNOVATION ACCEPTA
TOPIC# 63 OFFICE: HSD/XR IDENT#: 26873

WHEN PROMISING INNOVATIONS ARE INTRODUCED BUT NOT UTILIZED TO THEIR FULL CAPABILITIES, WE FACE A LOSS OF MONEY, MANPOWER, AND PRODUCTIVITY, AND STAND TO LOSE THE BENEFITS OF ADVANCES IN HARD AND SOFT TECHNOLGOES. THERE ARE A NUMBER OF INDEPENDENT RESEARCH PROGRAMS THAT EXAMINE SPECIFIC ASPECTS OF THE INNOVATION PROCESS. HOWEVER, THERE IS LITTLE CUMULATION OF RESULTS, NOR IS THIS INFORMATION AVAILABLE IN A FORMAT EASILY ACCESSIBLE AND MANIPULABLE BY MILITARY RESEARCHERS AND OTHERS INVOLVED IN THE INNOVATION PROCESS.

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THE RESULT, FOR APPLIED PURPOSES, IS THAT IT IS DIFFICULT TO GENERATE DIAGNOSTIC OR PRESCRIPTIVE INFORMATION ON PROBLEMS IN THE INNOVATION PROCESS FOR INTERVENTION. THERE SEEMS TO BE A DISCREPANCY BETWEEN THE KNOWLEDGE THAT SCHOLARS HAVE DEVELOPED ON THE INNOVATION PROCESS AND THE KNOWLEDGE THAT THOSE IN THE R&D ORGANIZATION HAVE TO USE -- CERTAINLY A DEFICIENCY IN TECHNOLOGY TRANSFER IN ITSELF. THE GOAL OF THE PRESENT RESEARCH IS TO AGGREGATE THIS INFORMATION, DEVELOP A COMPREHENSIVE MODEL OF THE INNOVATION PROCESS AT A LEVEL OF DETAIL TO SUPPORT DECISION-MAKING AND INTERVENTION, AND ADAPT THIS MODEL TO AN INTERACTIVE MICROCOMPUTER FORMAT. THE END PRODUCT WILL BE A MICROCOMPUTER-BASED DECISION SUPPORT SYSTEM WITH DIAGNOSTIC AND PRESCRIPTIVE CAPABILITY TO SUPPORT INNOVATION STRATEGY.

EC CONSULTING CO
200 - W 14TH ST/(2E)
NEW YORK CITY, NY 10011
CONTRACT NUMBER:
ELLIS D COOPER
TITLE:
LINGUISTIC COMPUTATION DIAGRAMS FOR NATURAL LANGUAGE INTERFACES
TOPIC# 64 OFFICE: AFHRL/HSD IDENT#: 26875

THIS PROPOSED PROJECT PROVIDES INTEGRATED METHODOLOGY FOR DEVELOPING NATURAL LANGUAGE INTERFACES (NLIs). USING CURRENT LINGUSTICS (X-BAR THEORY AND AUGMENTED PHRASE STRUCTURE GRAMMARS) AND ARTIFICIAL INTELLIGENCE (STRUCTURES, FRAMES AND CONNECTIONS) RESEARCH, IT ENCOMPASSES INNOVATIVE (1) CODELESS-PROGRAMMING DEVELOPMENTAL TOOLS FOR BUILDING NLIs, (2) THE OPTION OF PARALLEL PROCESSING FOR EFFICIENT SEMANTIC INTERPRETATION, AND (3) A DECLARATIVE PROGRAMMING APPROACH TO ACCURATE DISAMBIGUATION. 1. LINGUISTIC COMPUTATION DIAGRAMS (LCDs) ARE REPRESENTATIONS OF DATA AND CONTROL FLOW WHICH NATURALLY MAINTAIN DATA-TYPING AND FUNCTIONAL PROGRAMMING DISCIPLINE. SPECIAL DIAGRAM MACROS CALLED STRUCTURE-GATES (ANALOGOUS TO DIGITAL LOGIC CIRCUITS) REPRESENT CONDITIONAL ACTIONS CONNECTING SYNTACTIC AND SEMANTIC STRUCTURE COMPUTATIONS. 2. SPEED OF SEMANTIC INTERPRETATION WOULD BE INCREASED BY PARALLEL COMPUTATION. UNTIL THERE IS A PARALLEL NLI PLUG-IN BOARD, THE DIAGRAM INTERPRETER WILL BE A SERIAL SIMULATION OF THE INTRINSICALLY PARALLEL COMPUTATION REPRESENTED BY AN LCD. 3. ACCURACY OF REAL-TIME SEMANTIC INTERPRETATION COULD BE

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THE MOST IMPORTANT BENEFIT OF THE PROLOG BASED DECLARATIVE DISAMBIGUATION TECHNIQUE, WHICH ATTEMPTS TO ELIMINATE HYPOTHETICAL INTERPRETATIONS BY SEARCHING IN THE KNOWLEDGE STRUCTURE FOR CONTRADICTIONS.

ECODYNAMICS RESEARCH ASSOCS INC
PO BOX 8172
ALBUQUERQUE, NM 87198
CONTRACT NUMBER: F49620-88-C-0124
DR PATRICK J ROACHE
TITLE:
DESIGN OPTIMIZATION OF SYSTEMS GOVERNED BY PARTIAL DIFFERENTIAL EQUATIONS
TOPIC# 239 OFFICE: AFOSR/NM IDENT#: 28658

ALGORITHMS WILL BE DEVELOPED FOR THE AUTOMATED DESIGN OPTIMIZATION OF PHYSICAL SYSTEMS (MODELS) GOVERNED BY PARTIAL DIFFERENTIAL EQUATIONS (PDE'S) IN TWO AND THREE DIMENSIONS. THE IMMEDIATE MOTIVATION IS THE PROBLEM OF ELECTRODE DESIGN OPTIMIZATION FOR LASERS AND SWITCHES. THIS WORK WILL BUILD ON THE ELF CODES, USER-INTERACTIVE DESIGN CODES WHICH ACCURATELY CALCULATE THE FIELDS IN LASERS AND PULSED POWER SWITCHES. THIS WORK IS DIRECTLY OF INTEREST TO SDI PULSED POWER PROJECTS, AND IS ALSO APPLICABLE TO OTHER HIGHLY INTEGRATED DESIGN PROBLEMS GOVERNED BY SYSTEMS OF PDE'S, NOTABLY THE NATIONAL AEROSPACE PLANE. THE NUMERICAL SOLUTION OF THE PDE'S IS DEMANDING ON THE EFFICIENCY, ROBUSTNESS, ACCURACY, AND ACCURACY ESTIMATION OF THE SOLUTION METHODS, AND WILL BUILD ON PREVIOUSLY FUNDED AFOSR AND AFWL WORK ON ADAPTIVE GRID GENERATION AND MULTIGRID METHODS. THE OPTIMIZATION PROBLEM IS A NON-CLASSICAL ONE OF NONLINEARLY SOLUTION-CONSTRAINED OPTIMIZATION; IT WILL UTILIZE THE METHODS AND ALGORITHMS OF E. POLAK.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER:
DR MARTIN W RUPICH
TITLE:
FABRICATION OF CRYSTALLOGRAPHICALLY ORIENTED SUPERCONDUCTING OXID BY A LOW TEMPERATURE SOLUTION PHASE REACTION
TOPIC# 48 OFFICE: RADC/XPX IDENT#: 28574

SUBMITTED BY

THERE IS PRESENTLY A NEED TO INCREASE THE CURRENT CARRYING CAPABILITIES OF THE NEW HIGH TEMPERATURE, CERAMIC SUPERCONDUCTORS. UNLESS HIGHER CRITICAL CURRENTS ARE ACHIEVED IN BULK SUPERCONDUCTING MATERIALS, THE PRESENT CLASS OF MATERIALS WILL NOT MEET THE REQUIREMENTS OF MANY ANTICIPATED APPLICATIONS. THE GOAL OF THE PHASE I PROGRAM IS THE SYNTHESIS OF A CRYSTALLOGRAPHICALLY ORIENTED YBa(2)Cu(3)O(7-x) SUPERCONDUCTOR FROM AN ISOSTRUCTURAL PRECURSOR. THE PRECURSOR WILL BE PREPARED FROM REACTION OF A SOLUBLE Cu-O-Cu-O POLYMER WITH APPROPRIATE Ba AND Y COMPLEXES IN AN ORGANIC SOLVENT. THE PRECURSOR IS EXPECTED TO CONTAIN TWO-DIMENSIONAL Cu-O-Cu-O CHAINS THAT WILL ALIGN ALONG THE A-AXIS OF THE YBa(2)Cu(3)O(7-x) SUPERCONDUCTOR. CONVERSION OF THE PRECURSOR TO THE YBa(2)Cu(3)O(7-x) WILL RESULT IN A HIGH DEGREE OF CRYSTALLOGRAPHIC ORIENTATION AND AN EXTENDED MICROSTRUCTURE RESULTING IN A SUBSTANTIAL IMPROVEMENT IN THE CRITICAL CURRENTS. THE PROPOSED TECHNIQUE FOR THE SYNTHESIS OF YBa(2)Cu(3)O(7-x) SUPERCONDUCTORS WILL BE ADAPTABLE TO THE FABRICATION OF FILMS AND FILAMENTS IN ADDITION TO BULK MATERIAL. THE DEVELOPMENT OF THE SYNTHETIC PROCEDURE INTO A GENERAL PROCESS FOR THE PREPARATION OF THE SUPERCONDUCTORS WILL BE THE GOAL OF THE PHASE II PROGRAM.

EIDETICS INTERNATIONAL INC
3669 - W 240TH ST
TORRANCE, CA 90505
CONTRACT NUMBER:
ORLANDO J LABOY
TITLE:
INNOVATIVE AERODYNAMIC GUIDANCE/SENSOR CONCEPTS TO ENHANCE AIR-TO AIR MISSILE LAUNCH PERFORMANCE UNDER TRANSIENT/HIGH ANGLE OF ATTA
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23257

MODERN CLOSE-IN AIR-TO-AIR COMBAT CAN BE CHARACTERIZED AS A "POINT AND SHOOT" ENVIRONMENT BECAUSE OF THE ALL-ASPECT IR MISSILE. SUCCESS IN AIR COMBAT DEPENDS TO A LARGE DEGREE ON THE ABILITY TO RAPIDLY POINT THE AIRCRAFT AT THE ADVERSARY AND LAUNCH A MISSILE. SUCH POINTING MANEUVERS MAY PRODUCE LARGE ANGLES OF ATTACK. CONTROLLED MANEUVERING WELL INTO THE POST STALL ANGLE OF ATTACK REGION, OR SUPERMANEUVERING, IS CURRENTLY BEING EVALUATED AS A TACTICAL

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OPTION. A MAJOR CONCERN OF OPERATIONAL PILOTS IS WHETHER THE MISSILES CAN BE EFFECTIVELY LAUNCHED UNDER THESE EXTREME CONDITIONS. CONSIDERABLE EVIDENCE INDICATES THAT MISSILES LAUNCHES AT THESE HIGH AOA'S MAY BREAK LOCK AFTER LAUNCH BECAUSE OF "TIP OFF", OR THE MISSILE ATTEMPTING TO ALIGN ITSELF WITH THE RELATIVE WIND. AN ABRUPT "TIP-OFF" MAY CAUSE THE SEEKER TO EXCEED THE MAXIMUM TRACKING RATE AND/OR THE GIMBAL LIMITS, BREAK THE LOCK WITH THE TARGET, AND CAUSE THE MISSILE TO GO "BLIND". MORE KNOWLEDGE IS NEEDED ABOUT THE TRUE CAPABILITIES OF CURRENT MISSILES AND THE TECHNOLOGIES REQUIRED TO MAKE THEM EFFECTIVE IN A SUPERMANEUVERING ENVIRONMENT. THIS PROPOSED WORK EFFORT IS A MISSILE SIMULATION STUDY DESIGNED TO DEFINE THE LAUNCH BOUNDARIES OF THE CURRENT MISSILE, DETERMINE THE DESIGN FEATURES WHICH LIMIT THE LAUNCH ENVELOPE, AND EVALUATE INNOVATIVE DESIGN CONCEPTS TO EXPAND THE LAUNCH ENVELOPE.

ELECTRO SYSTEMS INTERNATIONAL INC
1281 KENNESTONE CIR - STE 100
MARIETTA, GA 30066
CONTRACT NUMBER:
POPE P BRITT
TITLE:
OPTICAL SIGNAL DISTRIBUTION IN LARGE PHASED ARRAY
TOPIC# 161 OFFICE: AFSD IDENT#: 27095

AN EFFICIENT ARCHITECTURE WILL BE DESIGNED FOR THE PHASING, EXCITATION, CONTROL, AND CALIBRATION OF A LARGE SPACE BASED ARRAY. IT IS PROBABLE THAT SIGNAL DISTRIBUTION WILL BE BY CLOSED OR OPEN OPTICAL PATHS. PHASING MAY BE BY DIRECT DIGITAL AT LOW FREQUENCIES, ACOUSTICAL LENSES AT MIDDLE FREQUENCIES, AND CONVENTIONAL PHASE-SHIFTERS AT HIGH FREQUENCEIS. RF EXCITATION DISTRIBUTION WILL BE BY CLOSED OR OPEN PATHS AT FREQUENCEIS LESS THAN 10 GIGAHERTZ. CONTROL DISTRIBUTION WILL BE BY DIGITAL MODULATED OPTICAL SIGNALS. CALIBRATION WILL BE INVESTIGATED. LEADING CALIBRATION CANDIDATES ARE LASER TRACKERS, LENGTH MODULATED ELEMENTS, AND FAR FIELD SOURCES.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
CONTRACT NUMBER:
WILLIAM S CHAN
TITLE:
STRAINED SUPERLATTICE InAsSb FOR LWIR DETECTOR
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23258

SUBMITTED BY

A PROPOSAL IS MADE TO DEVELOP STRAINED SUPERLATTICE (SSL) STRUCTURE OF InAs(1-x)Sb(x) BY MOLECULAR BEAM EPITAXY (MBE) FOR FABRICATING LONG WAVELENGTH INFRARED (LWIR) DETECTORS. A SPECIAL BUFFERED SUBSTRATE WILL BE USED FOR THE InAs(1-x)Sb(x) EPITAXY, AIMED AT ACHIEVING UNIFORM EPI LAYER HAVING A CUTOFF WAVELENGTH OF 12 MICRON AT 77K. IN PHASE I, SPECIAL MBE FIXTURES WILL BE DESIGNED AND MBE PROCESSES WILL BE DELINATED. THE SUCCESS OF THIS PROGRAM WILL LEAD TO MORE REPRODUCIBLE, UNIFORM AND SENSITIVE DETECTORS THAN THOSE OF LWIR HgCdTe.

ELECTROCHIMICA CORP
20 KELLY CT
MENLO PARK, CA 94025
CONTRACT NUMBER:
DR M EISENBERG
TITLE:
FUEL CELL POWER SYSTEM TECHNOLOGY - A NEW SAFE HIGH ENERGY SYSTEM
TOPIC# 207 OFFICE: BMO/MYSC IDENT#: 28619

A NOVEL VERY HIGH ENERGY FLOW BATTERY EMPLOYING A REPLACEMENT METAL ANODE, A LOW COST LIQUID OXIDIZER IN A DYNAMIC AQUEOUS SYSTEM IS PROPOSED FOR INVESTIGATION IN THE PHASE I PROGRAM. THE ATTRACTIVE-NESS OF THE NEW SYSTEM IS BASED ON: a) VERY HIGH ENERGY DENSITIES; b) POTENTIAL BROAD RANGE OF POWER DENSITY CAPABILITIES; c) SAFETY OF THE SYSTEM AND REACTANTS (AQUEOUS ELECTROLYTE - NO HAZARDOUS FUELS); d) LOW COST OF REACTANTS PER UNIT ENERGY GENERATED; e) AVOIDANCE OF EXPENSIVE CATALYSTS; f) BROAD RANGE OF DESIGN POSSIBILITIES, AND g) RELATIVELY LOW RESEARCH AND DEVELOPMENT RISKS. THE PHASE I PROGRAM IS DESIGNED TO EVALUATE THE DYNAMIC CATHODE WITH TWO VARIANTS OF THE ELECTROLYTE AND TO OBTAIN INITIAL COMPLETE CELL PERFORMANCE DATA FROM A SMALL LAB CELL. AN ADDITIONAL TASK WILL PROJECT ENERGY DENSISITES AND FUEL EFFICIENCIES AND RECOMMEND MATERIALS AND METHODS DESIGNED TO ACHIEVE A SUBSCALE TEST ON A MODULE TO BE DEVELOPED IN PHASE II.

ELECTROCHIMICA CORP
20 KELLY CT
MENLO PARK, CA 94025
CONTRACT NUMBER:
DR M EISENBERG
TITLE:
ADVANCED RECHARGEABLE NICKEL-ZINC BATTERY FOR BASING SYSTEMS
TOPIC# 222 OFFICE: BMO/MYSC IDENT#: 28641

SUBMITTED BY

ADVANCED BASING SYSTEMS REQUIRE HIGH EFFICIENCY AND HIGH ENERGY DENSITY SURVIVABLE POWER SOURCES CAPABLE OF kW TO MW OUTPUTS, UNDER FLEXIBLE OPERATIONAL CONDITIONS, INCLUDING MULTIPLE STARTS AND RE-CHARGEABILITY. CONSERVATIVELY DESIGNED, LOW ENERGY DENSITY (7-9 WH/#, 0.7-0.8 WH/in[3]) LEAD-ACID BATTERIES ARE USED AT PRESENT. SIGNIFICANT ENHANCEMENT OF ENERGY CAPABILITIES CAN BE ACCOMPLISHED BY THE PROPOSED Ni-Zn SYSTEM, WHICH HAS AN ENERGY DENSITY ADVANTAGE OVER OTHER CANDIDATES SUCH AS Ni-Cd, BOTH GRAVIMETRIC (28-35 WH/#) AND VOLUMETRIC (2.0-2.3 VS. 1.1-3 WH/in[3]). AS A RESULT OF A RECENT FUNDAMENTAL DEVELOPMENT OF A NEW CHEMISTRY FOR THE ZINC ELECTRODE IN THE NICKEL OXIDE-ZINC BATTERY, A SUBSTANTIAL INCREASE IN CYCLE LIFE HAS BEEN DEMONSTRATED IN ELECTROCHIMICA CORP. AND GOVERNMENT-CONDUCTED TESTS ON VENTED CELLS IN THE 15 TO 225 AH CAPACITY RANGE. THE DEVELOPMENT OF A RUGGED LOW TEMPERATURE VERSION OF THE PROVEN ELECTROCHIMICA VENTED CELL DESIGN IS PROPOSED WHICH WOULD BE TAILORED TO SATISFY ANTICIPATED CHARGING (TRICKLE) REQUIREMENTS. SMALL 10-12 AH CELLS WOULD BE TESTED FOR PHASE I DEVELOPMENT AND 200 AH CELLS WOULD BE CONSTRUCTED TO SERVE AS INTERMEDIATE SIZE PROTOTYPES FOR FUTURE APPLICATION IN BASING SYSTEMS.

ELECTRONIC DEVELOPMENT ASSOCS INC
1 WESTCLIFF DR
DIX HILLS, NY 11746
CONTRACT NUMBER:
LEONARD ZUCKERMAN
TITLE:
COOLING TOWER ICE DETECTION SYSTEM
TOPIC# 23 OFFICE: AEDC/DOT IDENT#: 28588

ELECTRONIC DEVELOPMENT ASSOCIATES, INC., EDA, ESTABLISHED IN 1982, WITH 25 YEARS OF PRODUCT DEVELOPMENT EXPERIENCE, NOTEWORTHY CONSULTANTS AND A FULLY EQUIPPED FACILITY, HAS FORMULATED A UNIQUE APPROACH FOR A RELIABLE COOLING TOWER ICE DETECTION SYSTEM. THE EDA APPROACH SHALL UTILIZE A VERY SIMPLE YET INNOVATIVE AND RELIABLE METHOD OF ICE DETECTION TAILORED FOR DETERMINING THE PRESENCE OF ICE FORMATION ON A WATER COOLING TOWER. THE EDA DETECTOR CAN BE PACKAGED IN A SMALL CONTAINER AND IS UNAFFECTED BY A WET ENVIRONMENT. COMBINING THE EDA ICE DETECTOR WITH A LIGHTNING RESISTANT DATA TRANSMISSION LINK AND A

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MULTICHANNEL DATA ACQUISITION SYSTEM RESULTS IN A COMPLETE ICE DETECTION AND MANAGEMENT SYSTEM. THE EDA ICE DETECTOR IS NOW POSSIBLE THROUGH RECENT ADVANCES IN COMPONENT TECHNOLOGY. EDA PROPOSES TO DEMONSTRATE THIS CONCEPT BY DESIGNING AND BUILDING AN OPTIMIZED DETECTOR AND DATA LINK BREADBOARD THEN TESTING AND DEMONSTRATING THEIR PERFORMANCE.

ELECTRONIC IMAGE SYSTEMS INC
600 BELLBROOK AVE
XENIA, OH 45385
CONTRACT NUMBER:
JOHN SELLERS
TITLE:
THREE-DIMENSIONAL DISPLAYS
TOPIC# 40 OFFICE: RADC/XPX IDENT#: 28566

ADVANCED AIR FORCE BATTLE MANAGEMENT SYSTEMS MUST PROCESS AND PRESENT COMPLEX, THREE DIMENSIONAL SITUATIONS TO TACTICAL OFFICERS IN REAL TIME. QUICK AND ACCURATE UNDERSTANDING OF THIS DATA IS VITAL TO THE SUCCESS OF THE MISSION AND THE SAFETY OF FRIENDLY FORCES. THE PROPOSED PROGRAM WILL CONTINUE THE DEVELOPMENT OF A NEW CONCEPT FOR A HOLOGRAM-LIKE VIDEO DISPLAY WHICH FULFILLS THE REQUIREMENTS FOR BATTLE MANAGEMENT APPLICATIONS. THIS AUTOSTEREOSCOPIC VIDEO DISPLAY (AVD) DOES NOT REQUIRE GLASSES OR GOGGLES, AND CAN PROVIDE FULL COLOR. IT IS CRT BASED, AND USES A SYSTEM OF MOVING SCAN LINES AND MOVING SLITS TO ACHIEVE THE HOLOGRAPHIC EFFECT. THE BASIC OPTICAL PRINCIPLE HAS BEEN DEMONSTRATED IN AN ENGINEERING MODEL. THE PHASE I EFFORT WILL ESTABLISH SPECIFICATIONS BASED ON AIR FORCE REQUIREMENTS AND SET KEY DESIGN PARAMETERS FOR THE PLANNED PHASE II PROTOTYPE DEVELOPMENT AND TESTING. A PHASE II WORK PLAN WILL ALSO BE DEVELOPED, AND THE PROBABILITY OF MEETING THE ULTIMATE FUNCTIONAL OBJECTIVES WILL BE ASSESSED. THE RESULTS OF THIS EFFORT WILL PROVIDE THE BASIS FOR AN INFORMED DECISION TO PROCEED WITH THE PROGRAM, AND A DETAILED PLAN OF ACTION TO FOLLOW.

ELECTRONIC WARFARE ASSOCS
2071 CHAIN BRIDGE RD
VIENNA, VA 22180
CONTRACT NUMBER:
JOHN COTTON JR
TITLE:
ELECTRONIC WARFARE (EW) REQUIREMENTS FOR HYPERVELOCITY VEHICLES
TOPIC# 78 OFFICE: AFWAL/ASD IDENT#: 26896

SUBMITTED BY

THIS PROPOSED PROGRAM WILL EXAMINE AND DEFINE (AN INITIAL ASSESSMENT) THE ELECTRONIC WARFARE (EW) REQUIREMENTS FOR HYPERVELOCITY VEHICLES. THE BASIC DIFFERENCES BETWEEN CONVENTIONAL EW REQUIREMENTS AND THOSE FOR HYPERVELOCITY VEHICLES WILL BE EXAMINED, AND THE SUITABILITY OF CURRENT ANALYSIS TOOLS WILL ALSO BE EXAMINED. A PRELIMINARY EVALUATION OF A SELECTED VEHICLE/MISSION WILL BE ACCOMPLISHED AND A PLAN FOR PHASE II DEFINED.

ELECTRONIC WARFARE ASSOCS
2071 CHAIN BRIDGE RD
VIENNA, VA 22180
CONTRACT NUMBER:
BOB DRERUP
TITLE:
AVIONICS REQUIREMENTS AND TECHNOLOGY ROADMAPS FOR HYPERVELOCITY VEHICLES
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 26997

THIS PROPOSED PROGRAM WILL EXAMINE AND DEFINE (AN INITIAL ASSESSMENT) THE AVIONICS REQUIREMENTS AND DETERMINE AN AUTOMATED MEANS FOR DOCUMENTING THESE REQUIREMENTS AND THE REQUIRED TECHNOLOGY ROADMAP FOR HYPERVELOCITY VEHICLES. THE DIFFERENCES BETWEEN CONVENTIONAL AVIONIC (OFFENSIVE, DEFENSIVE, COMMUNICATION AND NAVIGATION) REQUIREMENTS AND THOSE FOR HYPERVELOCITY VEHICLES WILL BE EXAMINED, AS WELL AS THE SUITABILITY OF CURRENT TECHNOLOGY. A PRELIMINARY EVALUATION OF ONE VEHICLE/MISSION WILL BE ACCOMPLISHED, A SAMPLE TECHNOLOGY DEVELOPED, AND A MEANS FOR CREATING AN AUTOMATED DATABASE AND REPORTING SYSTEM DEFINED AND A PLAN FOR PHASE II DEVELOPED.

ELECTROSYNTHESIS CO INC
PO BOX 16
EAST AMHERST, NY 14051
CONTRACT NUMBER:
NORMAN L WEINBERG
TITLE:
DISPOSAL OF CHEMOTHERAPEUTIC AGENT - CONTAIMINATED WASTE
TOPIC# 60 OFFICE: AFESC/RDXP IDENT#: 23230

SUBMITTED BY

A PHASE I ENGINEERING FEASIBILITY STUDY IS PROPOSED FOR SAFE, ECONOMICAL METHODS OF DISPOSAL OF SMALL QUANTITIES OF CHEMOTHERAPEUTIC AGENT WASTES. A PRIORITIZED LIST OF DISPOSAL METHODS WILL BE DEVELOPED, CONSIDERING 15 DIFFERENT AGENTS AND THEIR ASSOCIATED HANDLING, HAZARDS, AND SENSITIVE ANALYTICAL METHODS TO ASSURE ADEQUATE DESTRUCTION. RECOMMENDATIONS WILL BE PRESENTED FOR PHASE II LABORATORY, BENCH-SCALE OR PILOT TESTING OF THE MOST HIGHLY RATED DISPOSAL METHODS.

EMCORE CORP
35 ELIZABETH AVE
SOMERSET, NJ 08873
CONTRACT NUMBER:
RICHARD STALL
TITLE:
HYDROGEN RADICAL ASSISED METAL-ORGANIC CHEMICAL VAPOR DEPOSITION (HRAMOCVD) OF GaAs AND AlGaAs EXPITAXIAL LAYERS
TOPIC# 115 OFFICE: AFWAL/ASD IDENT#: 26949

IMPROVED COMPOSITIONAL CONTROL AND ENHANCEMENT OF SEMICONDUCTOR AND OPTO-ELECTRONIC MATERIALS ARE NECESSARY FOR THE FUTURE DEVELOPMENT OF DEVICES WHICH ARE DEPENDENT ON COMPLEX ULTRA-STRUCTURES. THIS INVESTIGATION WOULD DIRECTLY EXAMINE THE EFFECTS OF HYDROGEN RADICALS ON THE GROWTH AND QUALITY OF DOPED AND UNDOPED GaAs AND AlGaAs. CARBON IMPURITIES ARE OFTEN A PROBLEM IN GaAs AND AlGaAs AND GIVE RISE TO P-TYPE MATERIAL. PRELIMINARY RESULTS AT EMCORE AND ELSEWHERE INDICATE THAT HRAMOCVD MAY IMPROVE MATERIAL PROPERTIES BY ELIMINATING CARBON IMPURITIES. THIS IS SUGGESTED BECAUSE P-TYPE MATERIAL IS CONVERTED TO N-TYPE WHEN A HYDROGEN PLASMA IS INTRODUCED. HYDROGEN RADICALS WILL BE PRODUCED UPSTREAM BY A MICROWAVE PLASMA SOURCE. PARTICULAR ATTENTION WILL BE PAID TO DISTINGUISHING BETWEEN PLASMA-GENERATED UV RADIATION GROWTH EFFECTS FROM HYDROGEN RADICAL EFFECTS. CHARACTERIZATION WOULD INCLUDE ROOM AND LOW TEMPERATURE PHOTOLUMINESCENCE (PL) AND HALL MEASUREMENTS. CHANGES IN GROWTH RATE WILL ALSO BE DOCUMENTED. PHASE I WOULD DEMONSTRATE THE EFFECTIVENESS OF THIS PROCESS ENHANCEMENT TECHNIQUE.

EMCORE CORP
35 ELIZABETH AVE
SOMERSET, NJ 08873
CONTRACT NUMBER:
RICHARD A STALL
TITLE:
DEVELOPMENT OF DEVICE QUALITY SINGLE CRYSTAL THIN FILMS OF HIGH T(c) SUPERCONDUCTORS BY MOCVD
TOPIC# 117 OFFICE: AFWAL/ASD IDENT#: 26952

SUBMITTED BY

METAL ORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD) IS A VAPOR PHASE EXPITAXIAL TECHNIQUE WHICH HAS BEEN USED TO GROW HIGH PURITY SEMI-CONDUCTORS. THE MOCVD TECHNIQUE GIVES EXCELLENT CONTROL OVER COM-POSITION AND STRUCTURE AND SURPASSES MOLECULAR BEAM EXPITAXY IN YIELD AND THROUGHPUT OF MATERIAL. EMCORE PROPOSES TO APPLY THE MOCVD TECHNIQUE TO HIGH T(c) SUPERCONDUCTORS. THE PRIMARY OBJECTIVES OF THE PROPOSED RESEARCH ARE (1) TO DETERMINE THE MOCVD PARAMETERS FOR THE REPRODUCIBLE AND CONTROLLABLE DEPOSITION OF STOICHIOMETRIC THIN FILMS OF YBa(2)Cu(3)O(7-x) AND RELATED COMPOUNDS, AND (2) TO ESTABLISH THE OPTIMAL CONDITIONS FOR EPITAXIAL GROWTH OF THIN FILMS ON SINGLE CRYSTAL SUBSTRATES. ORGANOMETALLIC STARTING MATERIALS (PRECURSORS) FOR Ba, Y, AND Cu HAVE BEEN IDENTIFIED AND WILL BE USED TO PRODUCE, FIRST, ELEMENTAL AND, THEN, QUATERNARY FILMS IN PHASE I OF THIS RESEARCH. EX-SITU AND IN-SITU OXIDATION TECHNIQUES WILL BE DEVELOPED. INITIALLY, RESISTIVITY AND SUSCEPTIBILITY WILL BE USED TO IDENTIFY MATERIALS FOR DETAILED CHARACTERIZATION.

ENERGY & ENVIRONMENTAL RESEARCH CORP
1090 KING GEORGES POST RD
EDISON, NJ 08837
CONTRACT NUMBER:
RICHARD K LYON
TITLE:
NEW TECHNOLOGY FOR CONTROLLING NOx FROM INCINERATORS AND JET ENGINES
TOPIC# 62 OFFICE: AFESC/RDXP IDENT#: 23240

A NEW NONCATALYTIC CHEMICAL REACTION IS DISCLOSED WHICH PERMITS THE RAPID QUANTITATIVE CONVERSION OF NO TO NO(2). SINCE NO(2), UNLIKE NO, IS A STRONGLY ACIDIC GAS, THIS REACTION WILL ALLOW THE REMOVAL OF NO(x) FROM EXHAUST GASES EITHER BY USING WET SCRUBBERS OR BY INJECTING BASIC SORBENT AS A DRY POWDER INTO THE EXHAUST GAS. COM-BINING THIS NONCATALYTIC REACTION WITH AN ACID GAS REMOVAL SYSTEM COULD PROVIDE A VERY COST EFFECTIVE METHOD OF NO(x) CONTROL WHICH COULD BE APPLICABLE TO UNITS WITH EITHER WET SCRUBBERS OR PARTICU-LATE CONTROL SYSTEMS. HENCE THIS NEW TECHNOLOGY WOULD BE PARTICULARLY WELL SUITED TO THE AIR FORCE'S NEED TO CONTROL NO(x) EMISSIONS FROM INCINERATORS AND JET ENGINE TEST CELLS.

SUBMITTED BY

ENERGY COMPRESSION RESEARCH CORP
910 CAMINO DEL MAR - STE 'A'
DEL MAR, CA 92014
CONTRACT NUMBER:
OVED ZUCKER
TITLE:
EXPLODING FOIL INITIATOR FIRE SET DESIGN
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23259

ECR PROPOSES AN EXTREMELY COMPACT, LIGHT-WEIGHT AND SAFE EFI FIRING SET. THE CIRCUIT USES THE HYDRAULIC RAM PRINCIPLE TO CHARGE A CAPACITOR (A COMPACT EXTREME HIGH ENERGY DESIGN DESCRIBED IN A SEPARATE SBIR, A88-51) IN ONE STEP BY OPEN-CIRCUITING AN INDUCTOR. THE CONCEPT DOES AWAY WITH THE DC-DC CONVERTER AND TRANSFORMER AND RETAINS A TRIPLE SAFETY ARMING AND ABORT FEATURE. THE PROPOSAL DESCRIBES THE DESIGN OF THE COMPONENTS WHICH INCLUDE A (a) 1 MN TIME CONSTANT INDUCTOR WITH 17 cm(3) VOLUME (MINUS A 6.3 cm(3) INTERIOR HOLLOW SPACE WHICH IS USED TO HOUSE ALL THE OTHER COMPONENTS EXCEPT THE BATTERY), (b) A 20 cm(3), 24 V ENERGIZING BATTERY, (c) A 0.5 cm(3) CUSTOM SLEEVE-TYPE CAPACITOR (TO BE DESCRIBED BELOW) DESIGNED TO FIT INTO -- AND NOT INTERFER WITH -- THE INDUCTOR, AND A MECHANICAL/FUSE OPENING SWITCH TO INTERRUP 45 AMPERES AND HOLD OFF 3 kV. THE CIRCUIT MULTIPLIES THE POWER FROM THE 24 VOLT BATTERY BY 214, WITH AN OVERALL EFFICIENCY OF 64%. THE TOTAL VOLUME EXCLUDING THE BATTERY IS THAT OF THE INDUCTOR AT 17 cm(3).

ENERGY COMPRESSION RESEARCH CORP
910 CAMINO DEL MAR - STE A
DEL MAR, CA 92014
CONTRACT NUMBER:
OVED ZUCKER
TITLE:
MINITURIZED HIGH DENSITY CAPACITOR FOR EFI AND RELATED APPLICATIO
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23260

AN EXTREMELY HIGH ENERGY DENSITY CAPACITOR FOR A FIRE SET TO DRIVE

SUBMITTED BY

EXPLODING FOIL SLAPPER DETONATOR AND OTHER POWER CONDITIONING EQUIPMENT IS PROPOSED. THE DESIGN INTEGRATES THE HIGH ENERGY STORAGE FILMS (KUREHA/PENWALT) WITH INTEGRATED CIRCUIT TECHNIQUES (PHOTORESIST TYPE DIELECTRIC RELAXATION COATINGS) TO INCREASE THE ACTUAL WORKING FIELD TO APPROACH THE BREAKDOWN FIELD. THE PRECISE FIXED CHARGE AND DISCHARGE DURATIONS ALLOWS THE USE OF RESIST COATINGS ON FOIL EDGES AND OTHER LOCATIONS. THE RESISTIVITY GRADIENTS PRODUCE A VOLUME CHARGE DISTRIBUTIONS WHICH PREVENTS FIELD ENHANCEMENT AT EDGES AND IMPERFECTIONS RESULTING IN A MORE COMPACT CAPACITOR. FURTHERMORE, AN INTERCONNECTION APPROACH IS USED THAT MINIMIZES CURRENT CROWDING AT THE OUTPUT. THIS CONNECTION APPROACH DRASTICALLY REDUCES THE CURRENT DENSITY, MAGNETIC AND ELECTRIC FIELD, HEATING, AND CONDUCTIVE FOIL THICKNESS.

ENERGY COMPRESSION RESEARCH CORP
910 CAMINO DEL MAR - STE 'A'
DEL MAR, CA 92014
CONTRACT NUMBER:
OVED ZUCKER
TITLE:
HIGH PERFORMANCE SOLID STATE ARMATURE USING COMPOSITE TAMPING
TOPIC# 4 OFFICE: AD/PMR IDENT#: 23322

WE ARE PROPOSING A RADICAL DESIGN FOR A SOLID ARMATURE FOR EM GUNS WHICH ADDRESSES THE KEY LIMITATIONS OF SOLID ARMATURES. THE DESIGN USES THE TAMPING OF COPPER FILAMENTS WITH PYROLYTIC GRAPHITE IN ORDER TO RETAIN PHYSICAL INTEGRITY AND ELECTRICAL PROPERTIES TO MUCH HIGHER TEMPERATURES. IT ALSO RETAINS THE BRUSH CHARACTERISTICS AT MUCH HIGHER CURRENT DENSITY, TEMPERATURE AND PRESSURE THAN CONVENTIONAL MATERIALS. LASTLY IT ALLOWS FOR LITZING CONFIGURATION TO ADDRESS THE VELOCITY SKIN EFFECT IN THE RAIL. THE CONSTRUCTION TECHNIQUES PROPOSED ARE PRESENTLY USED IN OTHER AREAS.

ENERGY SCIENCE LABS INC
PO BOX 85608
SAN DIEGO, CA 92038
CONTRACT NUMBER:
TIMOTHY R KNOWLES
TITLE:
HIGH-ENERGY PHASE-CHANGE-MATRIX COMPOSITE BRAKES
TOPIC# 107 OFFICE: AFWAL/ASD IDENT#: 26937

SUBMITTED BY

WE PROPOSE TO STUDY THE FEASIBILITY OF UTILIZING ADVANCED THERMAL-STORAGE COMPOSITE MATERIALS IN HIGH-ENERGY BRAKING SYSTEMS. NOVEL GRAPHITE/PHASE-CHANGE-MATERIAL COMPOSITES, IN WHICH HIGH-CONDUCTIVITY FORMS OF GRAPHITE ARE PRECISELY DISPERSED IN SELECTED PHASE-CHANGE MATRIXES, POSSES HIGH-FLUX HEAT ABSORPTION CAPABILITIES. SEVERAL LOW DENSITY, HIGH-LATENT-HEAT MATERIALS ARE ATTRACTIVE CANDIDATES IN THE TEMPERATURE RANGE 600 - 1200 DEG C, AND NEWLY AVAILABLE, HIGH-CONDUCTIVITY FORMS OF GRAPHITE ARE ATTRACTIVE CANDIDATES FOR THE CONDUCTIVE COMPONENT. HEAT ABSORPTION TESTS AT ELEVATED TEMPERATURES ARE PROPOSED, AS WELL AS CYCLING AND CORROSION TESTS TO STUDY CHEMICAL COMPATIBILITY OF THE COMPONENTS. MODELING AND ANALYSIS WILL INCLUDE TEMPERATURE DEPENDENT THERMAL PROPERTIES. THE BEHAVIOR OF DISK BRAKE ROTORS CONSISTING OF THE NOVEL COMPOSITE MATERIAL UNDER THERMAL FLUXES OF 10 - 1000 W/cm2 (2) FOR DURATIONS OF 1 - 100s WILL BE SIMULATED NUMERICALLY. THE BENEFITS FOR HIGH-ENERGY BRAKES TECHNOLOGY WILL BE ASSESSED.

ENERGY SCIENCE LABS INC
PO BOX 85608
SAN DIEGO, CA 92138
CONTRACT NUMBER:
RICHARD A KLEMM
TITLE:
SUPERCONDUCTING TERAHERTZ DETECTORS AND GENERATORS
TOPIC# 42 OFFICE: RADC/XPX IDENT#: 28568

THIS PHASE I PROGRAM IS INTENDED TO DEMONSTRATE EXPERIMENTALLY AND THEORETICALLY THE TECHNICAL FEASIBILITY OF BUILDING HIGH-FREQUENCY GENERATORS AND RECEIVERS FROM THE HIGH TEMPERATURE SUPERCONDUCTORS SUCH AS YBa(2)Cu(3)O(7). THE EXPERIMENTAL METHOD PROPOSED IS TO CONSTRUCT ORIENTED THIN FILMS OF THE MATERIAL BY VACUUM VAPOR DE-POSITION OF THE ELEMENTS IN THE PRESCRIBED RATIOS UPON AN APPROPRIATE SUBSTRATE, AND TO STUDY THE CURRENT-VOLTAGE CHARACTERISTICS AT HIGH FREQUENCIES. THE FILMS WILL BE PREPARED IN VARIOUS GEOMETRIES: (1) UPON A FLAT SUBSTRATE SURFACE FOR THE INVESTIGATION OF THE CURRENT-VOLTAGE CHARACTERISTICS INTRINSIC TO THESE MATERIALS, AND (2) EN-CLOSING SMALL (LESS THAN 1 mm(2) IN CROSS-SECTION) SOLID CRYSTALS OF THE SUBSTRATE CUT INTO VARIOUS GEOMETRIES, SO AS TO FORM A CAVITY

SUBMITTED BY

SUITABLE FOR DETECTION AND GENERATION AT FREQUENCIES APPROACHING TERAHERTZ. IN ADDITION, THEORETICAL CALCULATIONS OF THE FEASIBILITY OF OBTAINING HIGH-FREQUENCY COHERENT JOSEPHSON RADIATION, AND THE ELECTROMAGNETIC RESPONSE OF A CAVITY ENCLOSED BY AN ANISOTROPIC SUPERCONDUCTOR WILL BE PERFORMED, WITH THE GOAL OF AIDING IN THE EXPERIMENTAL DESIGN.

ENIG ASSOCS INC
13230 INGLESIDE DR
BELTSVILLE, MD 20705
CONTRACT NUMBER:
DR JULIUS W ENIG
TITLE:
MODELING OF THERMAL HOT SPOTS IN THE SHOCK-TO-DETONATION TRANSITI IN ENERGETIC MATERIALS
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23262

THIS PROJECT IS AIMED AT PROVIDING A MORE PHYSICALLY-BASED MODEL OF THE EFFECTS OF THE CREATION OF THERMAL HOT SPOTS AND THEIR SUBSEQUENT REACTION (EXPLOSION) ON THE SHOCK-TO-DETONATION TRANSITION IN HETEROGENEOUS EXPLOSIVES. THIS WORK WOULD PROVIDE UNDERSTANDING OF EXPLOSIVES/PROPELLANTS SENSITIVITY TO UNPLANNED STIMULI SUCH AS BLAST WAVES, HIGH-SPEED FRAGMENT IMPACTS, AND HEAT. IT WOULD PROVIDE APPROXIMATE SOLUTIONS THAT LINK HOT SPOT FORMATION, THERMAL EXPLOSION, RESULTANT SHOCK FLOWS, AND CHEMICAL ENERGY LIBERATED, ALL IN THE "MICROSCOPIC" NEIGHBORHOODS OF THE HOT SPOTS, TO THE MOTION OF THE HOT SPOT-FORMING, "MACROSCOPIC" INCIDENT SHOCK TO PROVIDE A FEEDBACK MECHANISM. THE RESULT OF THIS ANALYSIS WOULD BE THE DERIVATION OF APPROXIMATE SOLUTIONS, BASED ON REASONABLY-DETAILED HOT SPOT FLOW DYNAMICS AND REACTIVITY, WHICH WILL SERVE AS CHEMICAL ENERGY SOURCE TERMS IN CONVENTIONAL HYDRODYNAMIC CODES USED FOR PREDICTING THE TRANSITION TO DETONATION IN EXPLOSIVES FOR ENGINEERING APPLICATIONS. THE NEW SOURCE TERMS WOULD REPLACE THE DIFFERENT EMPIRICAL SOURCE TERMS IN CURRENT VOGUE. BETTER PREDICTIVE METHODS ARE ESSENTIAL TOWARDS MEETING THE AIR FORCE/DOD NEED FOR DESIGNING INSENSITIVE MUNITIONS AS WELL AS SHAPED CHARGE AND SELF-FORGING FRAGMENT WARHEADS.

EPITAXX INC
3490 U.S. RT 1
PRINCETON, NJ 08540
CONTRACT NUMBER:
DR VLADIMIR S BAN
TITLE:
DEVELOPMENT OF A NEW VAPOR PHASE EPITAXY (VPE) TECHNIQUE TO PREPARE THE SEMICONDUCTOR - In 0.53 Ga 0.47 As
TOPIC# 55 OFFICE: RADC/XPX IDENT#: 28583

SUBMITTED BY

HYDRIDE VAPOR PHASE EPITAXY (VPE) IS A WELL ESTABLISHED GROWTH METHOD FOR DEVICES SUCH AS InGaAs PHOTODETECTORS. RECENTLY, AN IMPORTANT SIMPLIFICATION OF THE METHOD WAS DEMONSTRATED IN WHICH In-Ga ALLOY SOURCES (INSTEAD OF SEPARATE In AND Ga METALS) WERE USED. FURTHERMORE, IT WAS DEMONSTRATED THAT INTENTIONALLY ADDED HCl COULD UNEXPECTEDLY PRODUCE TERNARY ALLOYS OF CONSTANT COMPOSITION. EPITAXX PROPOSES TO CONTINUE THE DEVELOPMENTS MENTIONED ABOVE AND SPECIFICALLY, a) TO FIND AN OPTIMAL In-Ga SOURCE ALLOY FOR REPRODUCIBLE GROWTH OF LATTICE MATCHED In.(53)Ga.(47)As EPITAXIAL LAYERS, AND b) TO ASCERTAIN GROWTH CONDITIONS BY WHICH ADDED HCl WOULD CAUSE CONSISTENT GROWTH OF A LATTICE MATCHED ALLOY. EPITAXX PROPOSES TO DETERMINE THESE OPTIMAL CONDITIONS DURING PHASE I WITH THE HELP OF PROF. TIM ANDERSON (U. FLA). THE PHASE II PROPOSAL WOULD CONTAIN A DESIGN FOR A SIMPLIFIED VPE REACTOR WHICH UTILIZED THE PHASE I RESULTS. THE REACTOR WOULD BE BUILT AND OPTIMIZED DURING PHASE II AND DEVICES SUCH AS In.(53)Ga.(47)As/InP APDs, 1660 nm LEDs, In.(74)Ga.(36)As.(54)P.(46)/InP 1300 nm LASERS, In.(8)Ga.(2)As/InAs.(4)P.(6) DETECTORS FOR 2550 nm AND ROOM-TEMPERATURE DETECTOR ARRAYS FOR THE 1000 - 2500 nm REMOTE SENSING SPECTRAL BAND WOULD BE FABRICATED TO DEMONSTRATE THE SUCCESS OF THE TECHNIQUE.

EPSILON LAMBDA ELECTRONICS CORP
427 STEVENS ST
GENEVA, IL 60134
CONTRACT NUMBER:
KENNETH WOOD
TITLE:
HIGH SECURITY V-BAND WIRELESS COMMAND/RESPONSE DATA LINK FOR MISSILES AND SUBMUNITIONS
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23265

A CONCEPT FOR A WIRELESS V-BAND COMMAND/RESPONSE DATA LINK IS DESCRIBED WHICH WOULD HAVE MAJOR IMPACT ON COMMUNICATIONS IN AIRCRAFT AND SUPPORT ELECTRONICS SUBSYSTEMS (INCLUDING MISSILES AND SUBMUNITIONS). THE WIRELESS LINK CAN BE USED TO REPLACE HARD-WIRE CABLES OR DATA BUS (TO SAVE WEIGHT AND WEAPONS RELIABILITY) AND/OR AS A REDUNDANT BACKUP TO WEAPON AIRCRAFT SURVIVABILITY IN EVENT OF BATTLE DAMAGE. FURTHERMORE, THE WIRELESS LINK CAN EXTEND THE TOTAL

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AIRCRAFT COMMUNICATIONS SYSTEM TO MAINTAIN LIMITED RANGE DATA FLOW BETWEEN AIRCRAFT AND MISSILE AFTER LAUNCH OR BETWEEN A BUS MISSILE AND THE SUBMUNITIONS WHICH IT RELEASES. THE EMPHASIS IN THIS PROPOSAL IS ON THE USE OF THE WIRELESS LINK FOR EXTERNAL LINKS BETWEEN AIRCRAFT AND MISSILE AFTER LAUNCH OR BETWEEN BUS MISSILE AND SUBMUNITIONS AFTER THE SUBMUNITIONS ARE LAUNCHED BUT FLYING IN PROXIMITY TO THE BUS MISSILE. A MIL-STD 1553B CAPABILITY FOR SUCH A BUS IS FEASIBLE. THE USE OF THE V-BAND (55-65GHz) REDUCES PROBABILITY OF ENEMY DETECTION AND JAMMING OF THE COMMUNICATIONS LINKS. THE COMMAND/RESPONSE SYSTEM WOULD BE FORMATTED TO BE COMPLETELY COMPATIBLE WITH EXISTING 1553B DATA BUS SYSTEMS SO THAT THE EXTENDED REMOTE LINKS WOULD BE FULLY COMPATIBLE WITH THE AIRCRAFT DATA COMMUNICATIONS SYSTEM.

EPSILON LAMBDA ELECTRONICS CORP
427 STEVENS ST
GENEVA, IL 60134
CONTRACT NUMBER:
KENNETH WOOD
TITLE:
AIRCRAFT V-BAND WIRELESS COMMAND/RESPONSE DATA LINK
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 26998

A CONCEPT FOR A WIRELESS V-BAND COMMAND/RESPONSE DATA LINK IS DESCRIBED WHICH WOULD HAVE MAJOR IMPACT ON COMMUNICATIONS IN AIRCRAFT AND SUPPORT ELECTRONIC SUBSYSTEMS (INCLUDING MISSILES AND SUBMUNITIONS). THE WIRELESS LINK CAN BE USED TO REPLACE HARD-WIRED CABLES OR DATA BUS (TO SAVE WEIGHT AND IMPROVE RELIABILITY) AND/OR AS A REDUNDANT BACKUP TO IMPROVE WEAPON AIRCRAFT SURVIVABILITY IN EVENT OF BATTLE DAMAGE. FURTHERMORE, THE WIRELESS LINK CAN EXTEND THE TOTAL AIRCRAFT COMMUNICATIONS SYSTEM TO MAINTAIN LIMITED RANGE DATA FLOW BETWEEN AIRCRAFT AND MISSILE AFTER LAUNCH OR BETWEEN A BUS MISSILE AND THE SUBMUNITIONS WHICH IT RELEASES. THE EMPHASIS IN THIS PROPOSAL IS ON THE USE OF THE WIRELESS LINK WITHIN THE AIRCRAFT AND DEMONSTRATING THAT A MIL-STD 1553B CAPABILITY FOR SUCH A BUS IS FEASIBLE. THE USE OF THE V-BAND (55-65GHz) REDUCES PROBABILITY OF ENEMY DETECTION AND JAMMING OF THE COMMUNICATIONS SYSTEM. THE COMMAND/RESPONSE SYSTEM WOULD BE FORMATTED TO BE COMPLETELY COMPATIBLE WITH EXISTING 1553B DATA BUS SYSTEMS.

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ESSEX CORP
1040 WOODCOCK RD - STE 227
ORLANDO, FL 32803
CONTRACT NUMBER:
ROBERT S KENNEDY
TITLE:
ENHANCING COGNITIVE PERFORMANCE THROUGH BIOCYBERNETIC FEEDBACK
TOPIC# 63 OFFICE: SAM/HSD IDENT#: 26872

A THREAT TO MAN'S CAPABILITY TO FUNCTION EFFECTIVELY AND SAFELY AS AN INTEGRAL PART OF MILITARY SYSTEMS IS THE HIGH MENTAL WORKLOAD IMPOSED BY THESE SYSTEMS. THIS PROPOSED EFFORT IS AIMED AT DETERMINING THE FEASIBILITY OF ENHANCING PERFORMANCE ON COGNITIVE TASKS OR REMEDIATING PERFORMANCE DECREMENTS ON MENTAL TASKS BY PROVIDING PHYSIOLOGICAL FEEDBACK. PHASE I WILL ENTAIL MEASURING EYE MOTION BASED INDICES OF MENTAL WORKLOAD TO DETERMINE WHETHER THESE INDICANT REFLECT 1) SCALED WORKLOAD AND, 2) DECREASING MENTAL ALERTNESS THAT OCCURS UNDER LONG DURATION VIGILANCE CONDITIONS. PHASE II WILL ENTAIL DEVELOPING BIOCYBERNETIC-BASED ALGORITHMS TO USE TO FEED BACK TO OPERATORS TO DETERMINE WHETHER COGNITIVE PERFORMANCE CAN BE IMPROVED OR REMEDIATED AFTER DECREMENTS OCCUR WITH EXTENDED TASK PERFORMANCE.

EXFLUOR RESEARCH CORP
PO BOX 7807
AUSTIN, TX 78713
CONTRACT NUMBER:
DR THOMAS R BIERSCHENK
TITLE:
NONFLAMMABLE AIRCRAFT HYDRAULIC FLUIDS SUITABLE FOR USE IN EXTREM ENVIRONMENTS
TOPIC# 111 OFFICE: AFWAL/ASD IDENT#: 26944

THE GOAL OF THIS RESEARCH PROGRAM IS TO PREPARE SEVERAL NONFLAMMABLE HYDRAULIC FLUIDS WHICH CAN BE USED AT TEMPERATURES ABOVE 275 DEG F. PRELIMINARY EXPERIMENTS INDICATE THAT WE CAN MAKE A FLUID WHICH CAN BE USED IN THE TEMPERATURE RANGE OF -65 TO 375 DEG F. THE DIRECT

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FLUORINATION PROCESS INVOLVES THE SELECTION OF A HYDROCARBON WITH THE PROPER STRUCTURE WHICH IS CONVERTED TO A FLUOROCARBON BY A CONTROLLED REACTION WITH ELEMENTAL FLUORINE. SINCE THE STARTING MATERIALS ARE HYDROCARBONS, NUMEROUS STRUCTURES CAN BE MADE DUE TO THE WIDE VARIETY OF MONOMERS AND SYNTHETIC TECHNIQUES AVAILABLE. SPECIAL EMPHASIS WILL BE PLACED ON SELECTING INEXPENSIVE STARTING MATERIALS SO THAT THE FINAL COST OF THE FLUID WILL NOT EXCEED THAT OF A CHLOROTRIFLUOROETHYLENE-BASE FLUID (CTFE). THE MAJORITY OF THE RESEARCH PROPOSED IS GEARED TOWARDS PREPARING STRUCTURES WHICH WILL HAVE BULK MODULUS VALUES COMPARABLE TO THAT OF CTFE.

F&H APPLIED SCIENCE ASSOCS INC
7105 GREENE ST
PHILADELPHIA, PA 19119
CONTRACT NUMBER:
PETER R HERCZFELD
TITLE:
OPTICAL SIGNAL DISTRIBUTION IN LARGE PHASED ARRAYS
TOPIC# 161 OFFICE: AFSD IDENT#: 27097

THE PROPOSED WORK IS CONCERNED WITH THE DISTRIBUTION OF SIGNALS THROUGH A FIBEROPTIC NETWORK IN LARGE PHASED ARRAY ANTENNAS UTILIZED FOR RADAR AND COMMUNICATION PURPOSES. SPECIFICALLY, SMALL SCALE SUBARRAY CONSISTING OF NINE ELEMENTS WILL BE DESIGNED, FABRICATED, AND TESTED. THE SUBARRAY WILL UTILIZE A FIBEROPTIC DISTRIBUTION NETWORK TO ROUTE VARIOUS CONTROL AND INFORMATION SIGNALS BETWEEN THE CENTRAL PROCESSING UNIT AND THE TRANSMIT/RECEIVE MODULES. THE FIBEROPTIC FEED WILL BE COMPATIBLE WITH MMIC TRANSMIT/RECEIVE MODULES. THE FIBEROPTIC FEED PROVIDES FOR SUPERIOR PERFORMANCE IN TERMS OF BANDWIDTH, ISOLATION, AND IMMUNITY TO INTERFERENCE. THE FIBEROPTIC FEED IS ALSO SMALL, LIGHTWEIGHT, AND LOW COST, COMBINING IMPORTANT CONSIDERATIONS IN SPACE-BASED APPLICATIONS, AND IT IS COMPATIBLE WITH STATE OF THE ART OPTICAL SIGNAL PROCESSING AND COMPUTING TECHNIQUES. THE DELIVERABLES FOR THIS PROJECT WILL INCLUDE BOTH ANALYTICAL (SOFTWARE STUDIES) AND HARDWARE (A 3x3 SUBARRAY).

FAILURE ANALYSIS ASSOCS
2225 E BAYSHORE RD
PALO ALTO, CA 94303
CONTRACT NUMBER:
DR LAWRENCE E EISELSTEIN
TITLE:
HIGH PERFORMANCE Mg ALLOYS
TOPIC# 114 OFFICE: AFWAL/ASD IDENT#: 26948

SUBMITTED BY

MAGNESIUM ALLOYS ARE A VERY ATTRACTIVE STRUCTURAL MATERIAL FOR AEROSPACE APPLICATIONS DUE TO THEIR HIGH SPECIFIC STRENGTH AND STIFFNESS. ONE GLARING PROBLEM WITH THESE ALLOYS IS THEIR VERY POOR RESISTANCE TO CORROSION, PARTICULARLY WHEN EXPOSED TO CHLORIDE-CONTAINING ENVIRONMENTS. IF MAGNESIUM ALLOYS CAN BE DEVELOPED THAT HAVE SIGNIFICANTLY IMPROVED CORROSION RESISTANCE, THEN MANY NEW APPLICATIONS WILL BE FOUND TO INCORPORATE THEIR POTENTIAL FOR REDUCING A SYSTEM'S WEIGHT. FAILURE ANALYSIS ASSOCIATES (FaAA) PROPOSES TO USE MECHANICAL ALLOYING AS A METHOD BY WHICH TO MAKE THESE CORROSION-RESISTANT ALLOYS. THIS POWDER PROCESSING SCHEME ALLOWS VIRTUALLY ANY METALLIC ALLOY COMPOSITION TO BE PRODUCED WITHOUT REGARD TO LIQUID METAL SOLUBILITIES AND MELT REACTIVITY, THEREBY INCREASING THE POTENTIAL FOR OBTAINING AN ALLOY COMPOSITION WITH GREATER CORROSION RESISTANCE.

FAILURE ANALYSIS ASSOCS
2225 E BAYSHORE RD
PALO ALTO, CA 94303
CONTRACT NUMBER:
DONALD R JONES
TITLE:
CT DATA IMAGING OF SUB-PIXEL FEATURES
TOPIC# 172 OFFICE: AFAL IDENT#: 27117

IN THIS PROJECT, FAILURE ANALYSIS ASSOCIATES (FaAA) PROPOSES TO EVALUATE AND DEVELOP TECHNIQUES THAT MAY PROVIDE THE BASIS FOR USING CT DATA TO DETECT AND ASSESS THE NATURE OF SUB-PIXEL FEATURES IN ROCKET MOTOR COMPONENTS. FaAA PLANS TO APPLY NDE DATA ANALYSIS AND DISPLAY TECHNOLOGY, THAT WE HAVE BEEN DEVELOPING UNDER IR&D FUNDING. THE FaAA SYSTEM UTILIZES THE PIXAR IMAGE COMPUTER, IN CONJUNCTION WITH FaAA DEVELOPED IMAGE PROCESSING SOFTWARE. FaAA HAS PREVIOUSLY DEMONSTRATED THE CAPABILITY OF THIS SYSTEM TO IDENTIFY MATERIAL DEFECTS IN A PRACTICAL MANNER. FaAA WILL APPLY SIMILAR TECHNIQUES TO THE PROBLEM OF DETECTING FEATURES AT THE SUB-PIXEL LEVEL. AS WITH LARGER DEFECTS,THE PIXAR PROVIDES THE UNIQUE CAPABILITY TO OPERATE ON LARGE AMOUNTS OF DATA IN NEAR REAL TIME AND TO PROVIDE THREE-DIMENSIONAL IMAGES OF THE DATA. APPLICATIONS OF THE FaAA NDE DATA ANALYSIS SYSTEM TO THIS PROBLEM WILL BE EVALUATED IN PHASE I, WHICH

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WILL PRODUCE A PLAN FOR DEVELOPMENT OF A PRACTICAL CAPABILITY IN PHASE II.

FALCON COMMUNICATIONS CORP
3577 W DAVID LN
COLORADO SPRINGS, CO 80917
CONTRACT NUMBER:
PAUL COOK
TITLE:
SECURE NETWORK COMPONENT ARCHITECTURE
TOPIC# 28 OFFICE: ESD/XRB IDENT#: 28595

THE DOD PROGRAM FOR INTERCONNECTION OF COMMAND CENTER SYSTEMS REQUIRE THE DEVELOPMENT OF MULTILEVEL SECURE NETWORK COMPONENTS, SUCH AS PACKET SWITCHES, MESSAGE SWITCHES AND GUARD GATEWAYS. PREVIOUS SECURITY ARCHITECTURES OF THESE COMPONENTS HAVE BEEN BASED ON THE SECURE OPERATING SYSTEM SECURITY KERNEL DESIGN APPROACH DEVELOPED FOR MULTI-USER TIME SHARING SYSTEMS. FOR COMMUNICATIONS COMPONENTS, THIS HAS RESULTED IN UNNECESSARY COMPLEXITY IN THE SYSTEM SECURITY CERTIFICATION, AND SEVERE PERFORMANCE PENALTIES IN DATA THROUGHPUT. THE OBJECTIVE OF THIS PROGRAM IS TO DEMONSTRATED A NEW APPROACH FOR A SECURE NETWORK COMPONENT ARCHIETECTURE WHICH SEPARATES THE SECURITY FUNCTIONS FROM THE OPERATING SYSTEM AND PROCESSOR PROTECTION MECHANISMS. THE SECURITY REFERENCE MONITOR IS PLACED AT THE SYSTEM I/O LEVEL AND RESULTS IN SIGNFIFICANTLY LOWER COST AND RISK FOR CERTIFICATION OF THE SECURITY CRITICAL FUNCTIONS. A GENERALIZED EMBEDDED TRUSTED FUNCTION IS PROVIDED, WHICH IS NECESSARY TO SUPPORT THE IMPLEMENTATION OF SYSTEM UNIQUE GUARD TYPE FUNCTIONS FOR THE INTERCONNECTION OF COMMAND CENTER SYSTEMS. THIS CAPABILITY ALSO PROVIDES THE TRUSTED COMPUTING BASE REQUIRED FOR THE NEW NSA EMBEDDED ENCRYPTION ARCHITECTURE PROTOCOL LAYERS.

FARAH J
550 MEMORIAL DR - 6D
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
JOHN FARAH
TITLE:
DIRECT MEASUREMENT OF RELATIVE ROTATION THROUGH PHASE INTERFEROMETRY
TOPIC# 94 OFFICE: AFWAL/ASD IDENT#: 26920

SUBMITTED BY

THE WORD DIRECT IN THE TITLE OF THIS PROPOSAL REFERS TO THE DETECTION TECHNIQUE. PREVIOUS ROTATION SENSING SCHEMES ACTUALLY MEASURE THE LINEAR MOTION CAUSED BY ROTATION, SUCH AS, PENDULOUS ACTION OF THE DISPLACEMENT OF THE TIP OF THE CANTILEVER UPON DEFLECTION. THE MAJOR DISADVANTAGE OF THIS METHOD IS THAT IT CANNOT DIFFERENTIATE BETWEEN THE ROTATION AND THE LINEAR MOTION OF THE OBJECT IN QUESTION. THIS RESTRICTS ITS APPLICABILITY TO SITUATIONS WHERE THE AXIS OF ROTATION IS WELL DEFINED. MOREOVER, IT DOES NOT ALLOW SPATIAL AMPLIFICATION, I.E., THE CHANGE IN THE OPTICAL PATH LENGTH DIFFERENCE IS EQUAL TO THE LINEAR DISPLACEMENT OF THE OBJECT. THE DIRECT MEASUREMENT OF ROTATION, ON THE OTHER HAND, IS INHERENTLY INSENSITIVE TO LINEAR MOTION AND ALLOWS A PATH LENGTH DIFFERENCE MANY TIMES THE ACTUAL DISPLACEMENT OF THE OBJECT. INTERFEROMETRIC TECHNIQUES BASED ON THIS PRINCIPLE ARE MUCH MORE SENSITIVE THAN THE PREVIOUS ONES. TWO DIFFERENT METHODS TO EFFECT THE MEASURMENT OF DIRECT ROTATION ARE PRESENTED AND THEIR COMBINATION SUGGESTED TO PRODUCE THE ULTIMATE ROTATION SENSOR. THIS CONCEPT IS EXTENDED TO ALL THE CONVENTIONAL INTERFEROMETER CONFIGURATIONS AND WOULD PRODUCE AT LEAST TWO ORDERS OF MAGNITUDE IMPROVEMENT IN RESOLUTION AND SIGNAL TO NOISE RATIO OVER PREVIOUS INSTRUMENTS.

FERNO-WASHINGTON INC
70 WEIL WY
WILMINGTON, OH 45177
CONTRACT NUMBER:
PAMELA D ALLGEYER
TITLE:
IDENTIFICATION AND SIGNIFICANTS OF THE NEED TO REDESIGN THE MEDIC STRETCHER IN USE BY NATO FORCES WORLDWIDE
TOPIC# 63 OFFICE: SAM/HSD IDENT#: 26870

THE MEDICAL STRETCHER CURRENTLY USED BY NATO FORCES AROUND THE WORLD HAS BEEN IN USE SINCE WORLD WAR II. THE DESIGN OF THIS MEDICAL STRETCHER DOES NOT ALLOW MEDICAL CORPSMEN TO PERFORM A WIDE VARIETY OF MODERN MEDICAL TREATMENTS SUCH AS CARDIOPULMONARY RESUSCITATION (CPR), INTRATHORACIC DECOMPRESSION, ETC., IS SUSCEPTIBLE TO CHEMICAL UPTAKE AND IS DIFFICULT TO DECONTAMINATE WHEN EXPOSED TO CHEMICAL COMPOUNDS AND PATIENT DETRITUS. THE PURPOSE OF THE PROPOSED REDE-

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SIGN OF THE NATO MEDICAL STRETCHER IS TO STUDY THE FRAME DESIGN AND MATERIALS AND THE BED DESIGN AND MATERIALS FROM A STRENGTH, PATIENT SUPPORT, ADDITIONAL PATIENT TREATMENT TECHNIQUES AND DEVICES, DECONTAMINATION AND STORAGE STANDPOINT AND DEFINE A DESIGN TO MEET THE NEEDS OF NATO MEDICAL PERSONNEL INTO THE 21ST CENTURY.

FLAM & RUSSELL INC
PO BOX 444 - 506 PRUDENTIAL RD
HORSHAM, PA 19044
CONTRACT NUMBER:
LAWRENCE R BURGESS
TITLE:
HIGH SPEED DIGITAL ALGORITHMS FOR ADAPTIVE NULLING ARRAYS
TOPIC# 28 OFFICE: ESD/XRB IDENT#: 28596

DEGRADATION OF COMMUNICATION AND DATA LINKS BY THE PRESENCE OF INTERNATIONAL AND UNINTENTIONAL INTERFERING SIGNALS IS A MAJOR PROBLEM IN TACTICAL ENVIRONMENTS. THE USE OF HIGH SPEED DIGITAL ALGORITHMS TO CONTROL ADAPTIVE NULLING ARRAYS AND INTERFERENCE CANCELLERS IS A NECESSARY COMPLEMENT TO CURRENT SPREAD SPECTRUM AND FILTERING TECHNIQUES. THIS PROGRAM WILL INVESTIGATE MODIFICATIONS AND COMBINATIONS OF ADAPTIVE ALGORITHMS THAT EXHIBIT BOTH EXTREMELY FAST CONVERGENCE AND HIGH LEVELS OF INTERFERENCE CANCELLATION. IN ADDITION, EFFORTS WILL BE MADE TO MAXIMIZE COMPUTATIONAL EFFICIENCY, AND THE FEASIBILITY OF SYSTOLIC PROCESSING WILL BE STUDIED. THE KEY TECHNICAL PERFORMANCE CHARACTERISTICS TO BE EVALUATED ARE THE ADAPTATION TO MULTIPLE INTERFERENCE SOURCES AND THE ABILITY TO ADAPT TO CHANGES IN INTERFERENCE DOA, SYSTEM ERRORS, AND HIGHLY DYNAMIC ENVIRONMENTS.

FLOW RESEARCH INC
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER:
JAMES L DOYLE
TITLE:
REMOTE TRACK TAPERING
TOPIC# 26 OFFICE: AEDC/DOT IDENT#: 28592

SUBMITTED BY

THIS PROPOSAL ADDRESSES THE NEED TO DEVELOP A METHOD OF REMOTELY CONTROLLING THE TAPER OF THE INDIVIDUAL TRACK SECTIONS AT ARNOLD ENGINEERING DEVELOPMENT CENTER'S G-RANGE HYPERVELOCITY TEST TRACK. A FEASIBILITY STUDY WILL BE CONDUCTED TO DETERMINE THE TRACK TAPERING REQUIREMENTS, EVALUATE THE MOST PROMISING AND COST-EFFECTIVE POTENTIAL TAPERING METHODS. THE STUDY WILL INCLUDE THE FABRICATION OF KEY FUNDAMENTAL COMPONENTS AND PERFORMANCE OF LABORATORY MOCK-UP TESTS. AT THE CONCLUSION OF THIS EFFORT, AND IF AN ACCEPTABLE COST-EFFECTIVE METHOD IS REALIZED, A PHASE II PROPOSAL WILL BE GENERATED THAT OUTLINES IN-DETAIL, THE DEVELOPMENT OF A FULL-SCALE AUTOMATED REMOTE TRACKING TAPERING SYSTEM.

FLOW SYSTEMS INC
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER:
MARK H MARVIN
TITLE:
FEASIBILITY OF AN IN-FLIGHT TIRE INFLATION/DEFLATION SYSTEM
TOPIC# 98 OFFICE: AFWAL/ASD IDENT#: 26925

AIRCRAFT TYPICALLY USE PNEUMATIC TIRE EQUIPPED LANDING GEAR. MORE AIRCRAFT ARE BEING TASKED TO BE CAPABLE OF OPERATING TO AND FROM PAVED AND ROUGH/SOFT FIELDS OR RUNWAYS TO SUPPORT GROUND OPERATIONS. ADJUSTING TIRE PRESSURE FOR OPTIMAL TIRE/SOIL INTERACTION WILL BE NECESSARY TO ACCOMPLISH THIS GOAL. THIS PROPOSAL PRESENTS A RELIABLE SYSTEM FOR ADJUSTING TIRE PRESSURE WHILE IN FLIGHT. AIR WILL BE PROVIDED BY A SYSTEM EXTERNAL TO THE TIRE AND TRANSPORTED THROUGH A ROTARY JOINT TO THE TIRE. THE CIRITICAL ELEMENT OF THE SYSTEM IS A SWIVEL/VALVE WHICH ALLOWS THE TIRE TO BE INFLATED OR DEFLATED WHEN ACTIVATED, BUT ISOLATES THE TIRE PRESSURE FROM THE ROTARY SEAL WHEN NOT ACTIVATED. A MAJOR OBJECTIVE IS TO DESIGN, FABRICATE, AND TEST A SWIVEL/VALVE TO VERIFY THE FEASIBILITY OF ITS USE IN AN INFLATION/DEFLATION SYSTEM.

FLUID JET ASSOCS
1216 WATERWYCK TRAIL
SPRING VALLEY, OH 45370
CONTRACT NUMBER:
JOHN L DRESSLER
TITLE:
TWO DIMENSIONAL ORIFICE ARRAY MONODISPERSE DROP SOURCE
TOPIC# 131 OFFICE: AFWAL/ASD IDENT#: 26975

SUBMITTED BY

THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP A DROPLET GENERATOR THAT PRODUCES A RECTANGULAR ARRAY OF 112 STREAMS OF DROPLETS, ALL TRAVELING IN PARALLEL PATHS. THE ORIFICES CAN BE OF THE SAME DIAMENTER SO THAT ALL THE DROPS WILL BE THE SAME DIAMETER OR THE ORIFICES CAN BE OF SEVERAL DIAMETERS AND SEVERAL SPECIES OF DROPS WILL BE PRODUCED. THE FLUID ORIFICES WILL BE MADE USING THE PROCESS USED TO MAKE BIMETAL MASKS FOR PHOTOLITHOGRAPHY AND THE ORIFICE DIAMETERS CAN BE MADE FROM 40 TO 400 MICRONS. PIEZOELECTRIC DRIVERS WILL PROVIDE THE ACOUSTIC STIMULATION FOR UNIFORM DROP FORMATION. WE WILL MEASURE THE VIBRATIONAL MODES OF THE ORIFICE PLATE AND THE EFFECT OF ORIFICE PLATE MOUNTING ON THESE MODES. WE CAN MEASURE THE DEVIATIONS OF THE INDIVIDUAL STREAMS FOR PARALLEL AND HOW THESE DEVIATIONS VARY WITH FLUID OPERATING PRESSURE AND THE ORIFICE MOUNTING METHOD. OTHER RESEARCH TOPICS TO BE STUDIED ARE CORROSION RESISTANCE OF THE ORIFICE PLATE, THE JET DIAMETER UNIFORMITY, THE JET VELOCITY UNIFORMITY, AND THE RANGE OF FLUID VISCOSITY AND SURFACE TENSION THAT WILL OPERATE WITH THE DROP GENERATOR.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
D RANDOLPH BERRY
TITLE:
SMALL CRATER BRIDGING MATERIAL
TOPIC# 59 OFFICE: AFESC/RDXP IDENT#: 23222

AIR FORCE RAPID RUNWAY REPAIR (RRR) PROCEDURES MUST ADDRESS SMALL BOMB CRATERS FROM 6 TO 10 FT IN DIAMETER WITH LITTLE UPHEAVE. EXISTING TECHNIQUES REQUIRE CRATER-FILLING, WHICH IS LABOR, MATERIAL AND EQUIPMENT INTENSIVE. THIS PROPOSAL PRESENTS DESIGN CONCEPTS FOR CRATER-COVERS WHICH WILL NOT REQUIRE THE CRATER TO BE FILLED. UNSUPPORTED CRATER COVERS HAVE TWO BASIC REQUIREMENTS: STRENGTH SO THAT THEY DO NOT BREAK, AND STIFFNESS SO THAT THEY DO NOT BEND (DEFLECT) EXCESSIVELY. A PRELIMINARY CONCEPT IS SHOWN WHICH CONSISTS OF A THICKENED SECTION UNDER THE COVER (USING SOME OF THE SPACE INSIDE THE CRATER) AND ADJUSTABLE CABLE SUPPORTS WHICH WILL ENABLE A SINGLE DESIGN TO SUPPORT THE MAXIMUM LOADS FOR ANY SIZE

SUBMITTED BY

CRATER IN THE 6 TO 10 FT RANGE. PHASE I WILL CONSIST OF 3 MAJOR TASKS: DEVELOPMENT OF PRECISE DESIGN REQUIREMENTS, STRUCTURAL ANALYSIS AND FINAL DESIGN, AND PREPARATION OF PHASE II PLANS FOR CONSTRUCTION AND TESTING.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
TED KIRCHNER
TITLE:
ORDERED POLYMER HIGH PERFORMANCE MATRIX FOR AIRCRAFT STRUCTURAL COMPOSITES
TOPIC# 95 OFFICE: AFWAL/ASD IDENT#: 26921

THE KEY OVERRIDING DESIGN FACTOR IN FUTURE HIGH PERFORMANCE AIRCRAFT FROM ATF TO NASP IS WEIGHT. WEIGHT REDUCTION DESIGN GOALS ON THESE PROGRAMS ARE TUNNING BETWEEN 30 AND 50 PERCENT WHEN COMPARED TO CURRENT STATE-OF-THE-ART TECHNOLOGY. HIGH PERFORMANCE COMPOSITE MATERIALS ARE ESSENTIAL TO MEETING THESE GOALS. A VARIETY OF FIBERS ARE CURRENTLY AVAILABLE FOR THESE COMPOSITES, WHAT IS MISSING IS A "SUPER MATRIX" MATERIAL THAT WILL EFFICIENTLY SUPPORT THE ADVANCES IN SPECIFIC FIBER STRENGTH AND STIFFNESS WHILE PROVIDING SUPERIOR MATRIX DOMINATED PROPERTIES SUCH AS INTERLAMINAR TOUGHNESS, SHEAR AND FLEX STRENGTH AND STIFFNESS, DIMENSIONAL STABILITY AND VIBRATION DAMPING. THE PROPERTIES OF LIQUID CRYSTAL POLYMERS (LCP) SHOW THE POTENTIAL FOR MAJOR IMPROVEMENTS AS MATRIX MATERIAL IN GRAPHITE FIBER REINFORCED COMPOSITES. THE MAJOR OBSTACLE TO THEIR USE AS HIGH TEMPERATURE, HIGH MODULUS MATRIX MATERIALS IS PROCESSING. WE WILL EXPLORE FOUR POTENTIAL ROUTES TO PROCESSING FIBER REINFORCED ORDERED POLYMER MATRIX COMPOSITES. THE GOAL IS TO PROCESS RIGID ROD MATRIX GRAPHITE FIBER REINFORCED COMPOSITES INTO STRUCTURAL MATERIALS WITH ULTRA-EFFICIENT, THREE-DIMENSIONAL INTEGRITY AND WITHOUT THE INTER-LAMINAR DELAMINATION PROBLEMS OF EXISTING CONTINUOUS FIBER REIN-FORCED COMPOSITES.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
MARK A DRUY
TITLE:
RADIATION INDUCED MODIFICATION OF ORDERED POLYMERS FOR COMPRESSIVE STRENGTH
TOPIC# 110 OFFICE: AFWAL/ASD IDENT#: 26942

SUBMITTED BY

SOLUTION PROCESSED ORDERED (LIQUID CRYSTAL) POLYMERS MAY BE MODIFIED BY EXPOSURE TO ELECTRON OR PROTON BEAM RADIATION TO PRODUCE MATERIALS WITH IMPROVED COMPRESSIVE STRENGTH, DIMENSIONAL STABILITY, HIGH SPECIFIC STIFFNESS, GOOD STRUCTURAL DAMPING, HIGH TEMPERATURE CAPABILITY, AND ENVIRONMENTAL RESISTANCE FOR USE IN AEROSPACE STRUCTURES. OUR APPROACH IS TO EXPLOIT THE INHERENT MECHANICAL AND THERMAL STABILITY OF A CLASS OF RIGID ROD ORDERED LIQUID CRYSTALLINE POLYMERS AND TO IMPROVE THEIR TRANSVERSE PROPERTIES VIA MODIFICATION BY EXPOSURE TO ELECTRON OR PROTON BEAM RADIATION. AS A RESULT, WE WILL ACHIEVE A HIGH COMPRESSIVE STRENGTH FOR FILMS AND FIBERS. THE PROPOSED PROGRAM WILL EVALUATE THE FEASIBILITY OF RADIATION INDUCED MODIFICATION OF ORDERED POLYMERS TO IMPROVE TRANSVERSE MECHANICAL PROPERTIES AND HIGH COMPRESSIVE STRENGTH, OVER 150 ksi WITH LESS THAN 20 PERCENT REDUCTION IN LONGITUDINAL PROPERTIES. POLYPHENYLENE BENZOBISTHIAZOLE (PBT) IS CURRENTLY THE MOST TECHNICALLY ADVANCED LYOTROPIC ROD-LIKE POLYMER, AND WILL BE USED IN THE PROPOSED PROGRAM.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
RICHARD W LUSIGNEA
TITLE:
LIGHTWEIGHT HIGH PERFORMANCE CAPACITOR FILM
TOPIC# 123 OFFICE: AFWALASD IDENT#: 26962

ORDERED POLYMER FILMS PROCESSED FROM POLYPHENYLENE BENZOBISTHIAZOLE WILL BE MADE, TESTED AND EVALUATED FOR USE IN LIGHTWEIGHT HIGH PERFORMANCE CAPACITORS FOR AIRBORNE AND SPACEBORNE APPLICATIONS WITH ENERGY STORAGE OVER 3000 JOULES PER KILOGRAM. SPACE CHARGE SHIELDING NEAR THE ELECTRODES WILL BE USE TO PREVENT DIELECTRIC BREAKDOWN AT THE ELECTRODE INTERFACE.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
TED KIRCHNER
TITLE:
ULTRA HIGH PERFORMANCE Ni-Cd BATTERY FOR MISSILE APPLICATION
TOPIC# 124 OFFICE: AFWAL/ASD IDENT#: 26964

SUBMITTED BY

NICKEL/CADMIUM (Ni-Cd) BATTERIES HAVE FOUND EXTENSIVE APPLICATION IN MOST CURRENT AIRCRAFT AND MANY CURRENT MISSILES AND SPACECRAFT. FUTURE HIGH PERFORMANCE CRAFT PROGRAMS ARE SPECIFYING SUBSYSTEM WEIGHT REDUCTION GOALS AS HIGH AS 50 PERCENT WITH CONCURRENT INCREASES IN OPERABLE LIFE/RELIABILITY. BY INCORPORATING A CYANAMID NICKEL-COATED-GRAPHITE FIBER (NCG) TECHNOLOGY INTO A SEALED Ni-Cd HIGH PERFORMANCE BATTERY DESIGN WE EXPECT TO ATTAIN THSES GOALS. THE PROPOSED PROGRAM WILL DESIGN AND FABRICATE PRECISELY COMPARABLE NCG BATTERY ELECTRODES AND CURRENT TECHNOLOGY SINTERED NICKEL ELECTRODES. BOTH ELECTRODE TYPES WILL BE TESTED AS A FUNCTION OF TEMPERATURE, CYCLE NUMBER AND DISCHARGE RATE IN IDENTICAL TEST CELLS AND CONDITIONS. RELATIVE PERFORMANCE WILL BE CLEARLY DEMONSTRATED AND DOCUMENTED. BASED ON THESE DATA AND THE MANY OTHER ADVANTAGES OF THE CYANAMID NCG TECHNOLOGY OF CONCEPTUAL DESIGN FOR A NEW HIGH PERFORMANCE SEALED Ni-Cd BATTERY WILL BE GENERATED. THIS DESIGN WILL FORM THE THE BASIS OF A PHASE II PROGRAM THAT WILL DELIVER A TESTED PROTOTYPE.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
GARY CZUPRYNA
TITLE:
AIR SEPARATION BY HIGH TEMPERATURE ZEOLITE MEMBRANES
TOPIC# 134 OFFICE: AFWAL/ASD IDENT#: 26980

THE COLLECTION AND STORAGE OF OXYGEN-ENRICHED AIR ABOARD AIRBREATHING PROPULSION VEHICLES IS NECESSARY TO DEVELOP FULLY REUSABLE ORBITAL LAUNCH SYSTEMS. THE PRESENT AIR COLLECTION AND ENRICHMENT SYSTEM (ACES) DESIGN INVOLVES A HEAT EXCHANGER AND A CRYOGENIC ROTARY AIR SEPARATOR. SUBSTANTIAL IMPROVEMENTS HAVE TO BE MADE TO THE ACES TO REDUCE ITS WEIGHT AND MAKE IT SUITABLE FOR FLIGHT APPLICATIONS. THE PROPOSED PROGRAM INVOLVES THE DEVELOPMENT OF A HIGH TEMPERATURE MEMBRANE CONSISTING OF MOLECULAR SIEVE ZEOLITES UNIFORMLY DISPERSED IN AN INORGANIC BINDER MATRIX. THE COMPOSITE MEMBRANE WILL OPERATE AT THE INLET AIR STAGNATION TEMPERATURE AND ELIMINATE THE NEED FOR THE HEAT EXCHANGER. ZEOLITES EMBEDDED WITHIN THE MATRIX OR ON THE SUR-

SUBMITTED BY

FACE OF THE MEMBRANE WILL EITHER ADSORB NITROGEN TO THE EXCLUSION OF OXYGEN OR VICE VERSA. THE COMPOSITE MEMBRANE SYSTEM CAN BE OPERATED AT HIGH AIR HANDLING RATES AT A LOWERED SYSTEM WEIGHT. THE OBJECTIVE OF THE PHASE I PROGRAM WOULD BE TO DETERMINE THE FEASIBILITY OF THE HIGH TEMPERATURE INORGANIC MEMBRANE SYSTEM BY FABRICATING FLAT SHEET MEMBRANES AND CHARACTERIZING THEM WITH RESPECT TO THEIR ADSORPTIVE CAPACITY AND PERMEABILITY.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
DAVID A EVANS
TITLE:
A NEW METHOD FOR THE ULTRASONIC REPAIR OF COMPOSITES
TOPIC# 142 OFFICE: AFWAL/ASD IDENT#: 26986

CONVENTIONAL ULTRASONIC WELDING BY THROUGH-TRANSMISSION DOES NOT WORK WELL WITH THERMOPLASTIC COMPOSITES BECAUSE THE FIBERS SCATTER THE SOUND WAVES. A NEW METHOD IS PROPOSED WHICH FOCUSES THE ENERGY AT THE SURFACES TO BE JOINED. THE METHOD HAS BEEN SHOWN TO BE EFFECTIVE IN WELDING OTHER MATERIALS THAT ARE DIFFICULT TO WELD BY THROUGH-TRANSMISSION. THE PROGRAM WILL DEVELOP AND ADAPT THE METHOD FOR THE REPAIR OF COMPOSITE THERMOPLASTIC COMPONENTS. TEST DATA ON LAMINATE QUALITY AND PROCESS DEVELOPMENT WILL FOCUS ON PHASE II DEVELOPMENT INTO BATTLE DAMAGE AND DEPOT REPAIR SYSTEMS.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
JOHN T LENNHOFF
TITLE:
EVALUATION OF HIGH T(c) SUPERCONDUCTORS AS INFRARED DETECTORS
TOPIC# 163 OFFICE: AFSD IDENT#: 27100

THE AVAILABILITY OF THE 1-2-3 SUPERCONDUCTING OXIDES (SCO'S) IN WELL

SUBMITTED BY

CONTROLLED THIN-FILM FORM MAY DIRECTLY OFFER THE OPPORTUNITY TO PRODUCE INFRARED DETECTORS WITH WAVELENGTH SENSITIVITY OUT TO 20 MICRONS AND WITH FREQUENCY RESPONSES APPROACHING 100 GHz. EXTENSIVE RESEARCH IN MATERIALS PROCESSING SHOULD NOT BE REQUIRED FOR THIS APPLICATION - THE CONTROL OF STOICHIOMETRY AND HOMOGENITY OF COMPOSITION AVAILABLE WITH PRESENT PROCESSES SHOULD BE SUFFICIENT QUALITY TO PRODUCE THESE FAST DETECTORS. POLYCRYSTALLINITY AND A LOW Jc ARE NOT PROBLEMS. WHEN COMPARED WITH EXISTING TECHNOLOGY, THE PROCESSES USED TO MAKE THESE MATERIALS ARE INHERENTLY SIMPLER, AND SHOULD LEAD TO IMPROVED FREQUENCY PERFORMANCE AT THESE WAVELENGTHS AT DRAMATICALLY REDUCED COST. IN THE PROPOSED EFFORT, WE WILL SELECT THE THIN-FILM TECHNOLOGY WHICH SHOWS THE MOST PROMISE AT THE TIME OF AWARD. SEVERAL SAMPLES WILL BE PREPARED AND CHARACTERIZED WITH RESPECT TO PERFORMANCE AS DETECTORS.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
GARY CZUPRYNA
TITLE:
ADSORPTION OF MIGRATING CHEMICAL SPECIES BY COMPOSITE POLYMER COATINGS
TOPIC# 173 OFFICE: AFAL IDENT#: 27119

THE INTEGRITY OF THE MOTOR CASING INSULATION/SOLID PROPELLANT BOND INTERFACE IS INFLUENCED BY THE MIGRATION OF VOLATILE CHEMICAL COMPOUNDS ACROSS THE INTERFACE. LINERS ARE PRESENTLY USED TO INHIBIT MOISTURE MIGRATION. THE PROPOSED PROGRAM ADDRESSES THE PROBLEM OF PROVIDING A PROTECTIVE COATING TO ELIMINATE THE MIGRATION OF VOLATILE CHEMICALS EXUDED FROM THE INSULATION DURING VULCANIZATION. THE PROPOSED WORK INVOLVES THE DEVELOPMENT OF A COMPOSITE COATING CONSISTING OF A PERMEABLE BINDER INCORPORATING UNIFORMLY DISPERSED, POWERED SURFACE ACTIVE ADSORBENTS, SUCH AS SILICA GEL ACTIVATED CARBON AND/OR MOLECULAR SIEVES. TWO APPROACHES WILL BE EVALUATED FOR THE PERMEABLE BINDER; ONE INVOLVES A MICROPOROUS NYLON MEMBRANE AND THE OTHER INVOLVES A FELTED POROUS SHEET. THE COMPOSITE COATING WOULD ALLOW THE MIGRATING SPECIES TO PASS THROUGH THE PERMEABLE MATRIX AND BE RAPIDLY AND COMPLETELY ADSORBED BY SURFACE ACTIVE

SUBMITTED BY

AGENTS. THE OBJECTIVE OF THE PHASE I PROGRAM WOULD BE TO DETERMINE THE FEASIBILITY OF USING THESE COMPOSITE COATINGS TO INHIBIT THE MIGRATION OF THE VULCANIZATION BY-PRODUCTS. SMALL FLAT SHEET COATINGS WILL BE FABRICATED AND CHARACTERIZED WITH RESPECT TO THEIR ADSORPTIVE CAPACITY FOR THE BY-PRODUCTS. THEY WILL ALSO BE EVALUATED FOR THEIR EASE IN MANUFACTURING AND APPLICATION.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
BRUCE NAPPI
TITLE:
ENVIRONMENTAL EXTREME RECORDER
TOPIC# 54 OFFICE: RADC/XPX IDENT#: 28582

A PROGRAM IS PROPOSED WHICH WOULD PERFORM A SURVEY OF STATE-OF-THE-ART COMPONENTS AND METHODS TO PASSIVELY MONITOR AND RECORD EXTREMES OF TEMPERATURE, HUMIDITY AND VIBRATION (SHOCK). THE EFFORT WILL THEN CONCEPTUALIZE NOVEL APPROACHES AND TEST THOSE APPROACHES IN THE LAB. THE GOAL IS A LOW COST "SENSOR CARD" NOMINALLY 1" x 2" x 1/16" IN DIMENSION, COMBINING ALL 3 FUNCTIONS. THE PHASE I EFFORT WILL PROPOSE CRITERION AND A LAYOUT FOR AN OPTIMUM SENSOR CARD CONFIGURATION WHICH WILL BE THE BASIS FOR DEVELOPMENT OF A PROTOTYPE DURING PHASE II.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F49620-88-C-0128
DR MARK A DRUY
TITLE:
TECHNOLOGICALLY USEFUL NLO FILMS OF POLYPHENYLENE VINYLENE AND ITS COPOLYMERS
TOPIC# 234 OFFICE: AFOSR/NC IDENT#: 28651

CERTAIN CONJUGATED ORGANIC POLYMERS POSSESS INTERESTING NONLINEAR

SUBMITTED BY

OPTICAL PROPERTIES. TO DATE THERE EXIST SEVERAL OF THESE POLYMERS BUT ALTHOUGH THEY MAY HAVE LARGE THIRD ORDER NONLINEAR SUSCEPTIBILITIES, X(3), THEY MAY LACK THE NECESSARY OPTICAL QUALITY (LINEAR OPTICAL PROPERTIES), MECHANICAL PROPERTIES, OR LASER DAMAGE THRESHOLD TO BE OF PRACTICAL INTEREST. THE PROPOSED EFFORT WILL DETERMINE THE OPTIMUM PROCESSING CONDITIONS FOR A CLASS OF POLYMERS WITH A REPORTEDLY HIGH VALUE OF X(3), MEASURE THE NONLINEAR OPTICAL PROPERTIES, AND DETERMINE THE LINEAR OPTICAL PROPERTIES. THE CLASS OF POLYMERS IS THE POLYARYLENE VINYLENES. DEGENERATE FOUR WAVE MIXING (DFWM) EXPERIMENTS WILL BE PERFORMED TO ASSESS X(3). THE LINEAR OPTICAL PROPERTIES WHICH WILL BE EVALUATED ARE OPTICAL TRANSPARENCY AND OPTICAL FLATNESS. POLYARYLENE VINYLENES POTENTIALLY OFFER THE UNIQUE ADVANTAGES OF LIQUID CRYSTALLINE ORDER WITH THE POSSIBILITY OF MATCHING ELECTRIC FIELD DIRECTION TO ORIENTATION OF POLYMER, USEFUL OPTICAL WINDOW FOR SIGNAL PROCESSING, HIGH LASER DAMAGE THRESHOLD DUE TO AROMATIC STRUCTURE, AND THE POTENTIAL TO MOLECULAR ENGINEER PROPERTIES AND PROCESS INTO DESIRED ARCHITECTURES, PARTICULARLY FILM. THESE ARE SIGNIFICANT BENEFITS OVER EXISTING INORGANIC MATERIALS SUCH AS LITHIUM NIOBATE AND POTASSIUM HYDROGEN PHOSPHATE, WHICH ARE DIFFICULT TO PROCESS, DEGRADE RAPIDLY AND ARE FRAGILE.

FOWLER-MULLIN ASSOCS
5255 EDGEWORTH RD
SAN DIEGO, CA 92109
CONTRACT NUMBER:
JAY H MULLIN
TITLE:
NOISE SOURCE APPLICATIONS
TOPIC# 190 OFFICE: BMO/MYSC IDENT#: 28603

IN PHASE I THE PROPOSED STUDY WILL DETERMINE THE EFFECTIVENESS OF ADDING NOISE SOURCES TO EXISTING RVs AND DECOYS TO IMPROVE ABM PENETRATION BY DEGRADING THE SIGNAL-TO-NOISE CAPABILITY OF DEFENSE RADARS. DESIGN COMBINATIONS OF ELECTRONICS, BATTERIES AND ANTENNAS WILL BE DEFINED TO EVALUATE ACHIEVABLE SIGNAL-TO-MASKING HISTORIES AGAINST THE ABM THREAT RADARS AND TO DETERMINE THE ASSOCIATED PENALTIES IN WEIGHT/VOLUME AND THEREFORE IN DEPLOYMENT NUMBERS ON MMIII. PARTICULAR ATTENTION WILL BE PAID TO PLASMA EFFECTS, RADAR AGILITY IN FREQUENCY AND PRF AS WELL AS DEGRADATION OF RADAR

SUBMITTED BY

DISCRIMINATION CAPABILITY. FOWLER-MULLIN ASSOCIATES WILL BE SUPPORTED BY THE ELECTROMAGNETICS SYSTEM DIVISION OF THE RAYTHEON COMPANY.

FRONTIER TECHNOLOGY INC
530 E MONTECITO ST - STE 105
SANTA BARBARA, CA 93103
CONTRACT NUMBER:
JOSEPH S HASHEM
TITLE:
SRT AREA LIMITATION MODEL DEVELOPMENT
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 26999

THE PROPOSED RESEARCH EFFORT WILL DEVELOP AND DEMONSTRATE THE METHODOLOGIES USED TO RATIONALLY REDUCE AND PRIORITIZE THE EXPECTED DEPLOYMENT AREAS FOR SRTS OF INTEREST. THIS LIMITATION/PRIORITIZATION SCHEME WILL TAKE INTO CONSIDERATION THE AVAILABILITY OF ROADS, THE OFF ROAD MOBILITY OF THE SRT AND THEIR OPERATIONAL CONSTRAINTS. THE TECHNIQUES DEVELOPED WILL BE DEMONSTRATED FOR ONE SAMPLE AREA. PLANS FOR AUTOMATING THESE TECHNIQUES INTO A COMPUTER MODEL WILL BE PREPARED AND PROPOSED AS PHASE II ACTIVITIES.

FRONTIER TECHNOLOGY INC
530 E MONTECITO ST - STE 105
SANTA BARBARA, CA 93103
CONTRACT NUMBER:
EDWARD P JORDAN
TITLE:
UNMANNED AIR VEHICLES DEVELOPMENT PLAN
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 27000

THE OVERALL OBJECTIVE IS TO PREPARE A COMPREHENSIVE ASD/XR DEVELOPMENT PLAN FOR USAF UNMANNED AIR VEHICLES (UAVs), RECOMMENDING: UAV NEW STARTS OR MODIFICATIONS AS SOLUTIONS TO MISSION DEFICIENCIES; ENABLING TECHNOLOGY PROGRAMS; AND PROGRAMMATIC ACTIONS, TECHNOLOGY DEMONSTRATIONS, AND DECISION DATA REQUIRED TO JUSTIFY AND INITIATE THE RECOMMENDED PROGRAMS. THE TIME IS RIPE TO TAKE STOCK OF UAV

SUBMITTED BY

DEVELOPMENTS IN THE US DEFENSE COMMUNITY - WHERE WE ARE AND WHERE WE SHOULD BE GOING. A DOD UAV MASTER PLAN ACTIVITY HAS BEEN ESTABLISHED TO DEVELOP A TRI-SERVICE ROADMAP. THIS PROPOSAL EFFORT IS DESIGNED TO DEMONSTRATE THE FEASIBILITY AND UTILITY OF CONSOLIDATED UAV DEVELOPMENT PLANNING FROM THE USAF PERSPECTIVE, TO DEVELOP THE METHODOLOGIES AND DATA BASE FOR SUCH PLANNING, AND TO PROVIDE RECOMMENDATIONS FOR TECHNOLOGY AND SYSTEM DEVELOPMENTS WHICH WILL LEAD TO THE MOST MISSION-EFFECTIVE AND RESOURCE-EFFICIENT UTILIZATION OF UAVs BY THE USAF.

FRONTIER TECHNOLOGY INC
4141 COLONEL GLENN HWY - STE 140
BEAVERCREEK, OH 45431
CONTRACT NUMBER:
TIM RINGLER
TITLE:
INNOVATIVE CONCEPTS FOR SATISFYING SPECIAL OPERATION FORCES (SOF) REQUIREMENTS
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 27001

SPECIAL OPERATIONS FORCES (SOF) PROVIDE THE UNITED STATES A HIGHLY FLEXIBLE, SPECIALIZED CAPABILITY TO PURSUE NATIONAL OBJECTIVES DURING PEACE OR WAR, EITHER INDEPENDENTLY OR IN CONJUNCTION WITH CONVENTIONAL FORCES. THERE ARE SERIOUS DEFICIENCIES PROJECTED IN THE U.S. AIR FORCE'S CAPBILITY TO PROVIDE FUTURE SOF SUPPORT IN THE MISSION AREAS OF DIRECT ACTION, STRATEGIC RECONNAISSANCE, UNCONVENTIONAL WARFARE, COUNTERTERRORISM AND OTHER MISSION AREAS IN THE 2005 TIME FRAME. THERE IS AN URGENT NEED TO FOCUS AND RESOLVE CURRENT SOF REQUIREMENTS AND TO DEVELOP/ASSESS ALTERNATIVE SYSTEM DESIGNS TO ELIMINATE THOSE DEFICIENCIES. THE TECHNICAL OBJECTIVES OF THIS PROPOSED PROGRAM ARE: (a) TO FOCUS A SET OF SPECIAL OPERATIONS AIRCRAFT (CV -X) "STRAWMAN" REQUIREMENTS BY PERFORMING CONCEPT DEVELOPMENT AND TECHNOLOGY ASSESSMENT TRADEOFFS; (b) TO ESTABLISH A STRUCTURED DIALOG AMONG AIR FORCE DEVELOPMENT AGENCIES, USING COMMANDS AND INDUSTRY REGARDING SPECIAL OPERATIONS AIRCRAFT NEEDS; AND (c) TO PROVIDE TECHNOLOGY GUIDANCE FOR TECHNOLOGIES PERTIENT TO THE CONCEPT DESIGNS. THE OUTPUTS OF THE PROPOSED TWO PHASED EFFORT INCLUDE A CREDIBLE SET OF DESIGNS FOR LOCKHEED GEORGIA, A SUBSTANTIAL SET OF SOF REQUIREMENTS, AND A TECHNOLOGY ASSESSMENT ON EACH DESIGN CONCEPT.

SUBMITTED BY

FRONTIER TECHNOLOGY INC
530 E MONTECITO ST - STE 105
SANTA BARBARA, CA 93103
CONTRACT NUMBER:
EDWARD P JORDAN
TITLE:
THEATER STRATEGY GAME TACAIR C2 TRAINING SYSTEMS
TOPIC# 28 OFFICE: ESD/XRB IDENT#: 28597

AN OPERATIONAL PROBLEM EXISTS IN A LACK OF MEANS TO TRAIN TOP-ECHELON TACTICAL AIR COMMANDERS AND THEIR STAFFS IN THE COMPLEX DYNAMICS OF TWO-SIDED AIR CAMPAIGNS SUCH AS MAY BE FOUGHT IN EUROPE, KOREA, OR ELSEWHERE. WINING CAMPAIGN STRATEGIES MUST BE BASED ON GOOD UNDERSTANDING AND INSIGHT INTO THESE DYNAMICS, ESPECIALLY WITH RESPECT TO MISSION APPORTIONMENT DECISIONS. THERE IS AN OPPORTUNITY TO COMBINE IMPROVEMENTS IN PERSONAL COMPUTER TECHNOLOGY AND AVAILABILITY WITH AIR CAMPAIGN SIMULATIONS AND WITH EVOLVING TECHNIQUES FROM THE COMMERCIAL WARGAME INDUSTRY TO GENERATE A SIMULATION/GAME WITH GREAT POTENTIAL AS A LEARNING, TRAINING, AND DECISION AID. WE PROPOSE IN PHASE I TO PERFORM THE CONCEPTUAL DESIGN OF SUCH A GAME AND TO DEMONSTRATE ITS FEASIBILITY, BOTH TECHNICALLY AND AS A TRAINING DEVICE. IN PHASE II, WE WILL DEVELOP AN OPERATIONAL VERSION OF THE GAME FOR AIR FORCE USE. PHASE III OFFERS OPPORTUNITIES FOR DEVELOPMENT AND SALE OF ADDITIONAL AIR FORCE VERSIONS AND COMMERCIAL GAME VERSIONS.

GDM INC
PO BOX 73768
FAIRBANKS, AK 99707
CONTRACT NUMBER:
GERALD D MYERS
TITLE:
SHELTER - HIGHLY ERECTABLE DOME
TOPIC# 57 OFFICE: AFESC/RDXP IDENT#: 23200

OBJECTIVES OF THIS PROJECT ARE TO DEVELOP RESEARCH AND SCHEMATIC

SUBMITTED BY

DESIGNS, IF REQUIRED, FOR MOBILE LIGHTWEIGHT EASILY ERECTABLE AIRCRAFT SHELTERS. ACTIVITIES OF PHASE I WILL BE CENTERED ON; (1) PROGRAM DEVELOPMENT, (2) IDENTIFICATION AND CRITIQUE OF NOW AVAILABLE UNITS AS POSSIBLE MOBILE AIRCRAFT SHELTERS; AND (3) DEVELOPMENT OF SCHEMATICS FOR THE PROPOSED MOBILE AIRCRAFT SHELTERS. PROGRAM DEVELOPMENT WILL ADDRESS AND DEFINE SPECIFIC PARAMETERS AND CRITERIA THAT THE SHELTER MUST MEET IN ORDER TO FILL THE NEEDS OF THE U.S. AIR FORCE FOR MOBILE AIRCRAFT SHELTERS. WORK UNDER THIS PART WILL BE DONE WITH DIRECT PARTICIPATION OF THE PROSPECTIVE USER(S) TO ADDRESS ALL NEEDS AND FUNCTIONS OF THE PROPOSED UNITS. PART 2 OF THIS PHASE WILL REVIEW WHAT IS PRESENTLY AVAILABLE ON THE MARKET IN LIGHT OF THE PROGRAM DEVELOPED UNDER PART 1. THIS WORK WILL INVOLVE BOTH LITERATURE SEARCH/REVIEW AND VISITS TO/INSPECTION OF MANUFACTURERS OF THE EXISTING UNITS. UNDER PART 3, SCHEMATIC DESIGN WILL BE DEVELOPED FROM THE DATA GENERATED FROM PARTS 1 AND 2. PART 3 WILL REPRESENT THE FINAL PRODUCTION OF PHASE I.

GENERAL ENGINEERING & SYS ANALYSIS CO
8607 SECOND AVE - STE 306
SILVER SPRING, MD 20910
CONTRACT NUMBER:
DR N RANGARAJAN
TITLE:
DEVELOPMENT OF A MICROCOMPUTER BASED SOFTWARE SYSTEM FOR USE IN CREWMEMBER EJECTION ANALYSIS
TOPIC# 72 OFFICE: AAMRL/HSD IDENT#: 26887

WE PROPOSED TO DEVELOP A MICROCOMPUTER BASED INTEGRATED SOFTWARE SYSTEM FOR USE BY ENGINEERS WORKING ON CREWMEMBER EJECTION AND CAR CRASH PROBLEMS. THE PROPOSED SYSTEM WILL BE AN INTERACTIVE, MENU-DRIVEN SYSTEM MADE UP OF SEVERAL MODULES. WE PROPOSE TO DEVELOP THIS SYSTEM ON AN INTEL 80386 BASED MICROCOMPUTER. THE PROPOSED SYSTEM WILL COMPRISE OF MODULES WHICH WILL ALLOW THE ANALYST TO DEVELOP ANTHROPOMETRIC DATA FOR CREWMEMBERS, A SIMULATION PROGRAM, THE ATB, WHOSE OUTPUT WILL CONSIST OF KINEMATIC VARIABLES ASSOCIATED WITH MOTION OF VARIOUS BODY SEGMENTS AND APPROPRIATE POST PROCESSING MODULES. THE OUTPUT OF THE SIMULATION MODULE CAN BE PLOTTED ON THE SCREEN OR DUMPED TO A PRINTER, OR VIEWED AS TABULAR DATA. THE GROSS MOTION OF THE BODY SEGMENTS DURING THE SIMULATION CAN ALSO BE VIEWED

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ON THE SCREEN OR DUMPED OUT TO A PRINTER. THE FINAL VERSION OF THIS SYSTEM WILL ALSO INCLUDE A FINITE ELEMENT MODEL(S) WHICH WILL ALLOW THE ANALYST TO MAP THE OUTPUT DATA FROM THE ATB SIMULATION INTO INJURY MEASURES. THIS FINAL MODULE WILL BE DEVELOPED IN PHASE II BASED ON LITERATURE SEARCH TO BE CARRIED OUT IN PHASE I.

GENERAL IMAGING CORP
901 - NW 8TH AVE/STE B-1
GAINESVILLE, FL 32601
CONTRACT NUMBER:
JOHN D COX
TITLE:
SOLID-STATE DIGITAL X-RAY IMAGING SYSTEM FOR IMPROVED NDI/E TECHNIQUES
TOPIC# 145 OFFICE: AFWAL/ASD IDENT#: 26991

A LARGE AREA SOLID-STATE DIGITAL X-RAY IMAGING SYSTEM HAS THE POTENTIAL TO IMPROVE EXISTING NON-DESTRUCTIVE TEST AND INSPECTION TECHNIQUES. THE IMAGING SENSOR CONSISTS OF A FLUORESCENT SCREEN, A FIBER OPTICS BUNDLE AND AN ARRAY OF SOLID-STATE IMAGE SENSORS. SUBSEQUENT DIGITAL IMAGE PROCESSING AND ARCHIVAL TECHNIQUES OFFER COST SAVINGS AND IMPROVED RESOLUTION OVER MOST EXISTING MODALITIES. THE SENSOR CAN BE FABRICATED IN ARBITRARY SIZES.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
CONTRACT NUMBER:
DR SHIRLEY DARRAH
TITLE:
AROMATIC HYDROCARBON OPTRODES FOR GROUNDWATER MONITORING APPLICATIONS
TOPIC# 61 OFFICE: AFESC/RDXP IDENT#: 23236

AROMATIC HYDROCARBONS SPILLED OR LEAKING FROM UNDERGROUND STORAGE FACILITIES POSE A MAJOR THREAT TO GROUNDWATER RESOURCES. IN RESPONSE TO AIR FORCE REQUIREMENTS, GEO-CENTER, INC. PROPOSE TO DESIGN, DE-

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VELOP, AND TEST FIBER OPTIC OPTRODES SUITABLE FOR LONG TERM IN-SITU MONITORING OF GROUNDWATER AND EARTH MATERIAL FOR THE PRESENCE OF AROMATIC HYDROCARBONS. GEO-CENTERS, INC. WILL CONSTRUCT AROMATIC HYDROCARBON SENSORS USING TWO ALTERNATE FIBER OPTIC APPROACHES AND EVALUATE THEM ON AN EQUAL BASIS TO DETERMINE THEIR PERFORMANCE AND RECOMMEND THE MOST SUITABLE APPROACH FOR USE AT AIR FORCE SITES. THE TWO FIBER OPTIC APPROACHES ARE: 1. A POROUS WAVEGUIDE SENSOR: A POROUS SECTION OF FIBER IS IMPREGNATED WITH A CHEMICAL INDICATOR. THE OPTICAL TRANSMISSION OF THE INDICATOR WILL CHANGE WITH CONCENTRATION OF AROMATICS AND AN OPTICAL MEASUREMENT IS MADE. 2. AN INFRARED PROBE SENSOR: IR FIBER OPTICS ARE COUPLED TO A PROBE TIP WHERE EVANESCENT ABSORPTION SPECTROSCOPY IS USED TO MEASURE CONCENTRATION OF AROMATICS. AN ANALYSIS OF SYSTEM FUNCTION AND MULTIPLEXING METHODS WILL ALSO BE CONDUCTED.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
CONTRACT NUMBER:
JONATHAN F GRANT
TITLE:
DISTRIBUTED FIBER OPTIC ICE DETECTION SYSTEM
TOPIC# 23 OFFICE: AEDC/DOT IDENT#: 28589

THE FORMATION AND BUILDUP OF ICE ON OR IN OUTDOOR STRUCTURES IS A SIGNIFICIANT PROBLEM IN NORTHERN LATITUDES, OFTEN RESULTING IN DAMAGE TO PROPERTY AND NEARBY OBJECTS. WOODEN SUPPORT STRUCTURES FOR AEDC COOLING TOWERS ARE EXPOSED TO ICE BUILDUP THAT MUST BE DETECTED MANUALLY BEFORE CORRECTIVE OPERATING MODES CAN BE IDENTIFIED. A DISTRIBUTED FIBER OPTIC ICE DETECTION SYSTEM IS PROPOSED TO ALLOW AUTOMATION OF OPERATING MODES IN RESPONSE TO ICE BUILDUP. THE SYSTEM CONSISTS OF MULTIPLE ARRAYS OF SINGLE POINT SENSORS DEPLOYED OVER A LARGE AREA. NETWORKED NODES CONTROL THE ARRAYS AND REPORT THE LOCATION OF ICE FORMATION TO A MASTER CENTRAL CONTROL SYSTEM. THIS INFORMATION CAN THEN BE SENT TO AN OPERATOR OR CONTROL SYSTEM TO INITIATE PREVENTATIVE/CORRECTIVE ACTION. THE DISTRIBUTED FIBER OPTIC ICE DETECTION SYSTEM OFFERS A COST-EFFECTIVE MEANS TO DETECT AND PREVENT ICE BUILDUP ON AEDC COOLING TOWERS.

GEOTECHNICS INC
912 BRYDEN RD
COLUMBUS, OH 43205
CONTRACT NUMBER:
CHARLES A MOORE
TITLE:
A QUANTITATIVE DESCRIPTION OF SOIL MICROSTRUCTURE USING FRACTALS
TOPIC# 181 OFFICE: AFWL/PRC IDENT#: 27131

SUBMITTED BY

THEORY OF FRACTALS WILL BE USED TO DESCRIBE SOIL STRUCTURES AND TO DESCRIBE ALTERATIONS IN SOIL STRUCTURE DURING DEFORMATION. THE WORK PRODUCT WILL CONSIST OF COMPUTER BASED MATHEMATICAL MODELS FOR DESCRIBING SOIL MICROSTRUCTURE, MATHEMATICAL EXPRESSIONS FOR EXPRESSING SOIL PARTICLE INTERACTION FORCES IN A MANNER COMPATIBLE WITH FRACTAL THEORY, AND RECOMMENDATIONS FOR IMAGING AND IMAGE ANALYSIS TECHNIQUES FOR OBTAINING LABORATORY DATA ON SOIL SAMPLES.

GINER INC
14 SPRING ST
WALTHAM, MA 02254
CONTRACT NUMBER:
DR JOHN A KOSEK
TITLE:
SELECTION OF FUEL CELL POWER SYSTEM TECHNOLOGY
TOPIC# 207 OFFICE: BMO/MYSC IDENT#: 28620

BASED ON RESULTS OF LITERATURE AND LABORATORY EVALUATION, A FUEL CELL SYSTEM WILL BE SELECTED FOR ADVANCED TESTING/EVALUATION WITH AN ULTIMATE GOAL OF SIX MONTHS CONTINUOUS OPERATION AT CONSTANT POWER OUTPUT. THIS SIX MONTH POWER GENERATION PERIOD WILL FOLLOW EXTENDED PERIODS OF INOPERATION INTERSPERSED WITH INTERMITTANT, SHORT-TERM OPERATION. VARIOUS CATALYSTS AND MATERIALS OF CONSTRUCTION WILL BE EVALUATED TO DETERMINE THEIR SUITABILITY FOR THE PROPOSED APPLICATION. A RECOMMENDATION WILL BE MADE AS TO THE ANODE FUEL SOURCE.

GMS ENGINEERING CORP
8940-D ROUTE 108
COLUMBIA, MD 21045
CONTRACT NUMBER:
E J CASEY/J C CRYSTAL
TITLE:
DEVELOPMENT OF A PORTABLE G-HARDENED ELECTRO-PHYSIOLOGICAL DATA AND STORAGE DEVICE
TOPIC# 71 OFFICE: AAMRL/HSD IDENT#: 26885

IN THIS PROPOSE PHASE I SBIR DESIGN EFFORT, WE WILL DESIGN A

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PORTABLE, MULTICHANNEL, BATTERY-OPERATED DEVICE THAT WILL DIGITIZE, PROCESS, AND STORE PHYSIOLOGICAL DATA. IT WILL OPERATE IN FLIGHT UNDER HIGH LEVELS OF G STRESS. THE PROGRAMMABLE DEVICE WILL BE CAPABLE OF ACQUIRING DATA AT RATES SUFFICIENT TO RECORD EEG AND ECG WAVEFORMS. THROUGH THE USE OF DATA COMPRESSION TECHNIQUES, IT WILL ALLOW DATA COLLECTION AND STORAGE THROUGHOUT THE DURATION OF A MISSION USING MODEST AMOUNTS OF STORAGE MEMORY. ITS MODULAR DESIGN WILL PERMIT USE OF MORE THAN ONE DEVICE AT A TIME IN SITUATIONS WHERE VERY LARGE NUMBERS OF RECORDING CHANNELS ARE REQUIRED. AT THE CONCLUSION OF THE PHASE I EFFORT, WE WILL PROVIDE DESIGN DETAILS IN THE FORM OF DRAWINGS OF THE DEVICE, SCHEMATICS OF THE ELECTRONICS, AND FLOWCHARTS OF SOFTWARE PROGRAMS. WE WILL ALSO PROVIDE RESULTS OF TESTS AND RECOMMENDATIONS FOR THE PHASE II DEVICE DESIGN.

GREEN MOUNTAIN RADIO RESEARCH CO
50 VERMONT AVE - FORT ETHAN ALLEN
WINOOSKI, VT 05404
CONTRACT NUMBER:
FREDERICK H RAAB
TITLE:
FEASIBILITY STUDY OF COMMUNICATIONS THROUGH INTERVENING MEDIA
TOPIC# 209 OFFICE: BMO/MYSC IDENT#: 28624

A VARIETY OF ADVANCED-BASING CONCEPTS ENHANCE SURVIVABILITY BY COMBINING MISSILE MOBILITY WITH FIXED PROTECTIVE STRUCTURES (TUNNELS, GARAGES, ETC.). PROVIDING COMMUNICATION CONNECTIVITY BY INSTALLING VARIETY OF HARDENED ANTENNAS IS, HOWEVER, QUITE EXPENSIVE. A COMPLETELY PORTABLE, COMMUNICATION SYSTEM CARRIED ON EACH MOBILE LAUNCH VEHICLE IS THEREFORE DESIRABLE. COMMUNICATION THROUGH INTERVENING MEDIA IS DIFFICULT BECAUSE OF RESTRICTED ANTENNA SIZE, LOW SIGNAL LEVELS, MULTIPATH DISTORTION, FADING, AND HIGH LOCAL-NOISE LEVELS. EACH FREQUENCY BAND HAS UNIQUE CHARACTERISTICS IN PENETRATING THE CONDUCTING MEDIUM AS WELL TO/FROM THE DESIRED RECEIVER. A PRACTICAL SOLUTION INVOLVES NOT ONLY SELECTION OF THE RIGHT FREQUENCY, BUT ALSO CAREFUL ATTENTION TO MODULATION AND SIGNAL PROCESSING. COMMUNICATIONS SHOULD BE POSSIBLE IN SEVERAL WINDOWS OF THE RF SPECTRUM, INCLUDING LF GROUNDWAVE, HF SKYWAVE, AND UHF SATELLITE COMMUNICATION. THE PROPOSED PROGRAM WILL USE ANALYSIS AND SIMULATION TO DETERMINE THE CAPABILITIES OF EACH FREQUENCY BAND FOR EACH OF SEVERAL SHELTERS.

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MODULATION AND SIGNAL-PROCESSING OPTIONS WILL ALSO BE REVIEWED. THE PROPOSED PROGRAM WILL PREPARE A CANDIDATE SYSTEM DESIGN AND A PLAN FOR EXPERIMENTAL TESTING.

GREEN MOUNTAIN RADIO RESEARCH CO
50 VERMONT AVE - FORT ETHAN ALLEN
WINOOSKI, VT 05404
CONTRACT NUMBER:
FREDERICK H RAAB
TITLE:
ANTENNA SYSTEM FOR MOBILE MISSILE LAUNCHERS
TOPIC# 228 OFFICE: BMO/MYSC IDENT#: 28642

A VARIETY OF ADVANCED-BASING CONCEPTS ENHANCE SURVIVABILITY BY COMBINING MISSILE MOBILITY WITH FIXED PROTECTIVE STRUCTURES (TUNNELS, GARAGES, ETC.). PROVIDING COMMUNICATION CONNECTIVITY BY INSTALLING VARIETY OF HARDENED ANTENNAS IS, HOWEVER, QUITE EXPENSIVE. A COMPLETELY PORTABLE COMMUNICATION SYSTEM CARRIED ON EACH MOBILE LAUNCH VEHICLE IS THEREFORE DESIRABLE. COMMUNICATION THROUGH THE SHELTERING MEDIA IS DIFFICULT BECAUSE OF RESTRICTED ANTENNA SIZE, LOW SIGNAL LEVELS, MULTIPATH DISTORTION, FADING, AND HIGH LOCAL-NOISE LEVELS. HOWEVER, COMMUNICATIONS SHOULD BE POSSIBLE IN SEVERAL WINDOWS OF THE RF SPECTRUM, INCLUDING LF GROUNDWAVE, HF SKYWAVE, AND UHF SATELLITE COMMUNICATION. THE ANTENNA SUBSYSTEM IS A KEY COMPONENT OF SUCH A COMMUNICATION SYSTEM, AND SELECTION OF THE BEST TYPE OF ANTENNA FOR EACH BAND AND OPTIMIZATION OF ITS EFFICIENCY ARE CRITICAL TO SUCCESSFUL IMPLEMENTATION OF THE SYSTEM. THE PROPOSED PROGRAM USES THEORY AND NUMERICAL ANALYSIS TO DETERMINE THE CHARACTERISTICS OF SEVERAL TYPES OF ANTENNAS IN EACH FREQUENCY BAND FOR EACH OF SEVERAL SHELTERS. THESE RESULTS ARE THEN USED TO SELECT THE OPTIMUM ANTENNAS, TO PREPARE A CANDIDATE SYSTEM DESIGN, TO PREDICT ITS PERFORMANCE ACCURATELY, AND TO PREPARE A PLAN FOR EXPERIMENTAL TESTING.

GUILD ASSOCS INC
7030-D HUNTLEY RD
COLUMBUS, OH 43229
CONTRACT NUMBER:
JOHN SCHLAECHTER
TITLE:
GASEOUS OXYGEN SENSOR FOR ON-BOARD AIRCRAFT USE
TOPIC# 66 OFFICE: SAM/HSD IDENT#: 26881

SUBMITTED BY

AN ELECTRONIC CIRCUIT WILL BE DESIGNED TO SPECIFICALLY MEASURE A PHYSICAL PROPERTY OF AIRCREW BREATHING OXYGEN. OPERATION OF THE CIRCUIT AT A VERY SPECIFIC CONDITION SHOULD RESULT IN A STRONG, MEASURABLE RESPONSE PROPORTIONAL TO OXYGEN PARTIAL PRESSURE. THE PROPOSED EXPERIMENTAL PROGRAM WILL TEST THIS RESPONSE OVER THE RANGE OF OXYGEN CONCENTRATIONS, PRESSURES, AND TEMPERATURES EXPECTED TO OCCUR IN HIGH PERFORMANCE COMBAT AIRCRAFT. FURTHER TESTING WILL ACCOUNT FOR AFFECTS OF WATER VAPOR, CARBON DIOXIDE, AND PARTICULATES. SUFFICIENT DATA WILL BE COLLECTED TO PRODUCE A PHASE II PROTOTYPE DESIGN AND ALSO TO GENERATE A CONCEPTUAL PRODUCT DESIGN IN ORDER TO ESTIMATE CHARACTERISTICS AND COST OF THE FINAL PRODUCT. ULTIMATELY, THE DEVELOPED OXYGEN SENSOR WILL BECOME PART OF AN AIRCREW BREATHING OXYGEN SUPPLY WHICH WILL DELIVER OXYGEN AT PRECISE CONCENTRATION AT FLOWRATES SUFFICIENT TO MEET WIDE RANGING REQUIREMENTS. THE PROPOSED OXYGEN SENSOR HAS UNIQUE POTENTIAL TO MEET AIRCRAFT REQUIREMENTS INCLUDING SMALL SIZE, LOW COST, OXYGEN SPECIFICITY, RUGGED CONSTRUCTION, AND SIMPLE SOLID-STATE CONSTRUCTION.

HELIPUMP CORP
8435 BRECKSVILLE RD
CLEVELAND, OH 44141
CONTRACT NUMBER:
W JEFFREY COOK
TITLE:
MINIMIZATION OF NOx EMISSIONS FROM EXISTING FIXED SOURCES
TOPIC# 62 OFFICE: AFESC/RDXP IDENT#: 23242

EXHAUSTS FROM MILITARY INCINERATOR AND JET ENGINE TEST CELLS CONTAIN NITROGEN OXIDES (NOx) WHICH POSE ENVIRONMENTAL AND HEALTH HAZARDS. CONVENTIONAL NOx CONTROL TECHNOLOGIES ARE EXPENSIVE, ENERGY INTENSIVE, OR TECHNICALLY INSUFFICIENT. WE PROPOSE TO DEVELOP A NOVEL, ALTERNATIVE TECHNOLOGY TO CONTROL NOx EMISSIONS. THE TECHNOLOGY USES A SOLID-STATE REACTOR WHICH ELECTROCHEMICALLY CONVERTS NOx INTO NITROGEN AND OXYGEN. INITIAL EXPERIMENTAL RESULTS INDICATE NOx REMOVAL RATES OF 95+% TO LESS THAN 1 ppm. ENERGY REQUIREMENTS ARE ABOUT 33% AND CAPITAL AND ANNUAL COSTS APPROXIMATELY 15% OF ALTERNATIVE TECHNOLOGIES. THE PRIMARY OBJECTIVE OF THE PROPOSED WORK IS A DESIGN STUDY OF AN IGR SOLID-STATE, ELECTROCHEMICAL REACTOR CAP-

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BLE OF CONTROLLING OR ELIMINATING NITROGEN OXIDES FROM MILITARY INCINERATORS AND JET ENGINE TEST CELLS. FROM THIS DESIGN, A SMALL UNIT WILL BE CONSTRUCTED AND TESTED USING SIMULATED EXHAUST GAS STREAMS. THE RESULTING DATA WILL FORM THE BASIS FOR A PROCESS ECONOMIC EVALUATION WHICH WILL DETERMINE THE NEED FOR ADDITIONAL RESEARCH AND DEVELOPMENT.

HI-TECH INC
3600 - 16TH ST
ZION, IL 60099
CONTRACT NUMBER:
EDWARD A PILLAR
TITLE:
EFFICIENT FANS AND BLOWERS
TOPIC# 213 OFFICE: BMO/MYSC IDENT#: 28631

FANS OR BLOWERS IMPROVED TO ACHIEVE UP TO 80% EFFICIENCY WOULD BE A GREAT BENEFIT TO OUR ENTIRE SOCIETY. TWO-THIRDS OF THE ELECTRIC POWER GENERATED IN OUR COUNTRY TODAY DRIVES ELECTRIC MOTORS, MANY OF WHICH ARE DRIVING FANS AND BLOWERS WITH 30% OR LESS EFFICIENCY. THIS WASTED ENERGY REDUCES MOTOR WINDINGS AND BEARING LIFE, AND ALSO REQUIRES US TO BUILD OVERSIZED POWER STATIONS TO COMPENSATE FOR THIS LOSS. IN PHASE I, WE WILL TAKE THE FIRST STEP TOWARDS DEVELOPING FANS AND BLOWERS AIMED AT 80% EFFICIENCY BY INVESTIGATING EXISTING HARDWARE AND EXPLORING COMPONENT COMBINATIONS THAT MIGHT WORK TO EXTEND PRESENT EFFICIENCIES. WE WILL CARRY FORWARD THE RESULTS OF THIS ANALYSIS INTO PHASE II WHERE WE WILL BUILD AND TEST PROTOTYPES BASED ON OUR FINDINGS WITH THE GOAL OF ARRIVING AT A FINAL DESIGN THAT ACHIEVES THE DESIRED EFFICIENCY. OUR PRINCIPAL INVESTIGATOR, EDWARD PILLAR, HAS SPENT 25 YEARS IN THE ELECTRIC MOTOR/FAN AND BLOWER INDUSTRY, AND OUR COMPANY HAS 14 YEARS EXPERIENCE IN DEVELOPING SPECIFICATIONS AND MANUFACTURING AIR-MOVING DEVICES IN A WIDE RANGE OF SIZES FOR LEADING BUSINESS MACHINE, HVAC AND APPLIANCE INDUSTRY COMPANIES.

HITTITE MICROWAVE CORP
21 CABOT RD
WOBURN, MA 01810
CONTRACT NUMBER:
JAMES MONIZ
TITLE:
40 WATT POWER AMPLIFIER
TOPIC# 194 OFFICE: BMO/MYSC IDENT#: 28606

SUBMITTED BY

A NEW POWER FET CONFIGURATION DEMONSTRATED AT HITTITE MICROWAVE CORPORATION EMPLOYES THE CAPABILITIES OF THE GaAs MONOLITHIC INTEGRATED CIRCUITS TECHNOLOGY TO SOLVE THE IMPEDANCE MATCHING AND STABILITY PROBLEMS WHICH LIMIT THE MAXIMUM USABLE PERIPHERY FOR HIGH POWER SOLID STATE POWER AMPLIFIER APPLICATIONS. IF THIS TECHNOLOGY IS DEVELOPED AND APPLIED TO THE IMPLEMENTATION OF C-BAND HIGH POWER AMPLIFIERS, THE POTENTIAL EXISTS FOR REALIZING EFFICIENT AND WELL BEHAVED 40 WATT AMPLIFIERS IN SMALL PHYSICAL VOLUME AND AT AFFORDABLE COST. THIS PROPOSAL CONTAINS THE BACKGROUND INFORMATION AND THE DESCRIPTION OF OUR TECHNICAL APPROACH FOR SUCH A DESIGN EFFORT TO DEMONSTRATE THE FEASIBILITY.

HITTITE MICROWAVE CORP
21 CABOT RD
WOBURN, MA 01801
CONTRACT NUMBER:
JAMES MONIZ
TITLE:
WIDEBAND ELECTRONICS
TOPIC# 196 OFFICE: BMO/MYSC IDENT#: 28609

THIS PROPOSAL EXAMINES NEW CONCEPTS AND APPROACHES TO WIDEBAND MICROWAVE SIGNAL PROCESSING COMPONENTS BASED ON GaAs MMIC TECHNOLOGY. A UNIQUE TRAVELING-WAVE TYPE WIDEBAND POWER AMPLIFIER IS DESCRIBED INCORPORATING A NOVEL POWER FET CONFIGURATION DEMONSTRATED AT HITTITE MICROWAVE. IN THIS PROPOSAL, WE ALSO DESCRIBED NEW IDEAS AND APPROACHES FOR WIDEBAND SIGNAL CONTROL COMPONENTS SUCH AS SWITCHES, PHASE SHIFTERS, ATTENUATORS, LIMITERS, ACTIVE POWER DIVIDERS/COMBINERS AND NONRECIPROCAL COMPONENTS SUCH AS CIRCULATORS. THIS PROPOSAL CONTAINS THE BACKGROUND INFORMATION AND THE DESCRIPTION OF OUR TECHNICAL APPROACH FOR SUCH A DESIGN EFFORT TO DEMONSTRATE THE FEASIBILITY.

HYPRES INC
500 EXECUTIVE BLVD
ELMSFORD, NY 10523
CONTRACT NUMBER:
SADEG M FARIS
TITLE:
PROPOSAL FOR DEVELOPMENT OF HIGH TEMPERATURE SUPERCONDUCTING MICROWAVE DELAY LINES
TOPIC# 76 OFFICE: AFWAL/ASD IDENT#: 26892

SUBMITTED BY

BASED ON EXPERTISE IN ADVANCED SUPERCONDUCTING TECHNOLOGIES, MICROWAVE COMPONENTS AND THE HIGH TEMPERATURE CERAMIC SUPERCONDUCTORS, HYPRES PROPOSES TO DEVELOP AND DEMONSTRATE MINIATURIZED LOW-LOSS DELAY LINES BASED ON THIN FILMS OF HIGH TEMPERATURE SUPERCONDUCTORS. WE WILL EXPLORE UTILIZATION OF SUPERCONDUCTING FILMS INCLUDING NIOBIUM ALLOYS AND COPPER OXIDE CERAMICS SUCH AS Y(2)Ba(2)Cu(3)O(7+o). THESE DELAY LINES IN COMBINATION WITH OTHER SUPERCONDUCTIVE OR SEMICONDUCTING MICROWAVE COMPONENTS AND MINIATURIZED CRYCOOLERS, FORM THE BASIS FOR COMPACT SIGNAL PROCESSING SYSTEMS IN THE 1-20 GHz RANGE. PRODUCT GOALS INCLUDE 1-20 GHz FREQUENCY RANGE AND OPERATING TEMPERATURES CONSISTENT WITH COMPACT CLOSED-CYCLE COOLERS UP TO 77 DEG K. HYPRES' UNIQUE APPROACH RELIES ON ESTABLISHED DESIGN, PROCESS AND CHARACTERIZATION FACILITIES FOR MICROWAVE COMPONENTS BASED ON SUPERCONDUCTING FILMS, TRANSMISSION LINES AND ACTIVE DEVICES. IN PHASE I, WE PROPOSE THE ANALYSIS, DESIGN AND FABRICATION OF A MASK SET CONTAINING THIN FILM DELAY LINES. IN PHASE II, WE PROPOSE THE FABRICATION AND CHARACTERIZATION OF HIGH TEMPERATURE SUPERCONDUCTIVE DELAY LINES FOR FREQUENCIES FROM 1-20 GHz.

I-MATH ASSOCS INC
PO BOX 560788
ORLANDO, FL 32856
CONTRACT NUMBER:
ALEXANDER AKERMAN III
TITLE:
PARALLEL PROCESSING APPLICATIONS FOR AVIONICS
TOPIC# 85 OFFICE: AFWAL/ASD IDENT#: 26907

A SINGLE FORM OF A "MASSIVELY PARALLEL" COMPUTER ARCHITECTURE IS BEING SOUGHT TO HOST THE COMPLETE SUITE OF A VISION MODEL-BASED OBJECT RECOGNITION ALGORITHM. TWO APPROACHES WILL BE INVESTIGATED DURING PHASE I: (1) A SIMD ARCHITECTURE REPRESENTED BY THE AMT DISTRIBUTED ARRAY PROCESSOR DAP, AND (2) A MIMD ARCHITECTURE BASED UPON THE SHILOACH/VISHKIN ALGORITHM. THE DAP 510 WILL BE EMULATED ON I-MATH'S VAX COMPUTERS USING THE COMMERCIALLY AVAILABLE DAP SIMULATOR; THE MIMD ARCHITECTURE WILL BE STUDIED USING THE NYU ULTRACOMPUTER. COMPLETE EXPLORATION OF BOTH TECHNOLOGIES IS ASSURED BY KEY I-MATH CONSULTANTS; DR. ROBERT HUMMEL (NYU COURANT INSTITUTE) AND

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DR. WINTRHROP SMITH (AMT CHIEF APPLICATION SCIENTIST). FOR PHASE I, THE SCERPO (SPATIAL CORRESPONDENCE, EVIDENTIAL REASONING, PERCEPTUAL ORGANIZATION) MODEL-BASED ALGORITHM WILL BE USED AS THE CANDIDATE FOR SIMD/MIMD IMPLEMENTATION. IT'S PERFORMANCE IN EACH ARCHITECTURE WILL BE BENCHMARKED AGAINST ITS CURRENT PROCESSOR IMPLEMENTATION.

IAP RESEARCH INC
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER:
TIMOTHY J McCORMICK
TITLE:
COMMUTATION SWITCH DEVELOPMENT
TOPIC# 4 OFFICE: AD/PMR IDENT#: 23332

HIGH CURRENT ROTARY SWITCHES HAVE BEEN SUCCESSFULLY USED TO REPETITIVELY COMMUTATE VERY HIGH CURRENTS. THE DEMONSTRATED COMMUTATION VOLTAGE CAPABILITY OF THESE SWITCHES IS LESS THAN 100 V. MANY APPLICATIONS REQUIRE VOLTAGES AN ORDER OF MAGNITUDE HIGHER. THIS PROGRAM IS DIRECTED TO INCREASING THE COMMUTATION VOLTAGE OF ROTARY SWITCHES. TWO TECHNIQUES, RESISTANCE GRADING AND TWO-STAGE OPERATION WILL BE INVESTIGATED. THE MOST PROMISING TECHNIQUE WILL BE SELECTED AND DEMONSTRATED.

IAP RESEARCH INC
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER:
JOHN B BARBER
TITLE:
INCREASED TURBINE ENGINE PERFORMANCE THROUGH MAGNETIC COMPRESSION
TOPIC# 128 OFFICE: AFWAL/ASD IDENT#: 26970

FOR INCREASED TURBINE ENGINE PERFORMANCE HIGHER ROTOR SPEED AND COMPRESSION RATIOS ARE REQUIRED. THE OBJECTIVE OF THIS PROGRAM IS TO REDUCE THE BLADE STRESSES ASSOCIATED WITH INCREASED ROTOR SPEEDS AND COMPRESSION RATIOS. A MAGNETIC SYSTEM APPROACH WILL BE INVESTI-

SUBMITTED BY

GATED. DETAILED MECHANICAL, MAGNETIC, AND THERMAL ANALYSES WILL BE PERFORMED TO DETERMINE FEASIBILITY.

IMPLANT SCIENCES CORP
35 CHERRY HILL DR
DANVERS, MA 01923
CONTRACT NUMBER:
DR A J ARMINI
TITLE:
DEVELOPMENT OF LOW FRICTION SURFACES ON SILICON NITRIDE BEARING ELEMENTS
TOPIC# 128 OFFICE: AFWAL/ASD IDENT#: 26971

THE BENEFITS OF USING HIGH PERFORMANCE CERAMICS FOR ROLLER BEARING ELEMENTS HAVE BEEN RECOGNIZED AND SOUGHT AFTER FOR SOME TIME. CERAMIC ROLLING ELEMENTS WOULD MAKE POSSIBLE HIGHER TEMPERATURE, LIGHTER AND MORE WEAR-RESISTANT BEARINGS, ESPECIALLY IN A GAS TURBINE APPLICATION. PREVIOUS TESTS HAVE SHOWN THAT THE SURFACE FINISH AND SUBSURFACE DAMAGE IN Si(3)N(4) ROLLERS AND BALLS ARE CRITICAL AND MAKE THE DIFFERENCE BETWEEN SUCCESS OR FAILURE OF THE BEARING IN FULL SCALE TESTS. ION IMPLANTATION WITH CERTAIN ELEMENTS SHOULD LOWER THE SURFACE FRICTION BY FORMING A NEAR-SURFACE SOLID LUBRICANT LAYER IN ADDITION TO MAKING THE SURFACE LESS SENSITIVE TO SURFACE FLAWS. WE PROPOSE TO EXAMINE THE EFFECT OF VARIOUS TYPES OF IMPLANTED IONS ON THE MICROHARDNESS, WEAR, AND COEFFICIENT OF FRICTION OF Si(3)N(4) BEARING MATERIAL. SIMILAR STUDIES ON OTHER CERAMICS, SUCH AS Al(2)O(3), ALTHOUGH NOT SUITED FOR BEARING APPLICATIONS, HAVE SHOWN AN AMORPHOUS TRANSITION AND INCREASE IN FRACTURE TOUGHNESS AFTER ION IMPLANTATION OF CHROMIUM. DURING PHASE I, SCIENTIFIC FEASIBILITY WILL BE SHOWN THROUGH MICROSTRUCTURAL ANALYSIS AND MACROSCOPIC FRICTION AND WEAR TESTS ON Si(3)N(4) MATERIAL.

INCREMENTAL SYSTEMS CORP
319 S CRAIG ST
PITTSBURGH, PA 15213
CONTRACT NUMBER:
DA BAKER/J C SHULTIS
TITLE:
MECHANISMS FOR PERSISTENT OBJECT MANAGEMENT IN A DISTRIBUTED SOFTWARE DEVELOPMENT ENVIRONMENT
TOPIC# 38 OFFICE: RADC/XPX IDENT#: 28563

SUBMITTED BY

WE ENVISION A SOFTWARE DEVELOPMENT ENVIRONMENT IN WHICH THE COMPUTER SYSTEM ASSUMES INCREASING RESPONSIBILITY FOR THE INFORMATION PROCESSING TASKS INVOLVED IN ALL ASPECTS AND STAGES OF SOFTWARE DEVELOPMENT. THE SUCCESS OF SUCH A SYSTEM DEPENDS ON RELIABLE AND EFFICIENT MECHANISMS FOR REPRESENTING AND MANAGING A WIDE VARIETY OF INFORMATION IN ARBITRARY COMPUTING ENVIRONMENTS, SUCH AS DYNAMICALLY CONFIGURABLE HETEROGENEOUS DISTRIBUTED SYSTEMS WITH REMOVABLE MEDIA. THIS PHASE I SBIR PROJECT CONSISTS OF A DESIGN OF MECHANISMS FOR DISTRIBUTED OBJECT MANAGEMENT AND A STUDY OF THE FEASIBILITY OF THOSE MECHANISMS THROUGH TWO CASE STUDIES. THE SUCCESS OF THIS PROJECT WILL LAY THE FOUNDATION FOR A SUCCESSFUL IMPLEMENTATION IN PHASE II.

INDUGAS INC
PO BOX 12180 - 5924 AMERICAN RD
TOLEDO, OH 43612
CONTRACT NUMBER:
KLAUS H HEMSATH
TITLE:
DISPOSAL OF CHEMOTHERAPEUTIC AGENT - CONTAMINATED WASTE
TOPIC# 60 OFFICE: AFESC/RDXP IDENT#: 23231

CHEMOTHERAPEUTIC AGENT CONTAMINATED WASTES PRESENT A PROBLEM OF DISPOSAL FOR HOSPITALS, INCLUDING GOVERNMENT HOSPITALS, DUE TO THE TOXIC NATURE OF THESE AGENTS AND THE NECESSARY TO CONTROL ACCESS TO THESE WASTES AT ALL TIMES. THIS PROPOSAL USES A PROVEN DISPOSAL METHOD UTILIZING THERMAL DESTRUCTION OF THE WASTES. THE DESTRUCTION APPARATUS IS LOCATED IN ITS OWN ROOM WITH INDEPENDENT VENTILATION. WASTE IS DELIVERED IN PLASTIC BAGS OR CONTAINERS AND IS DEPOSITED, UNOPENED, INTO THE UNIT. THE SYSTEM IS ACTIVATED BY THE OPERATOR AFTER THE PROGRAMMABLE LOGIC UNIT INDICATES EQUIPMENT READINESS. AT THIS POINT THE OPERATOR ALLOWS THE PROGRAMMABLE LOGIC UNIT TO TAKE OVER ALL PROCESS FUNCTIONS. THE WASTE IS SUBJECTED TO TEMPERATURES SUFFICIENTLY HIGH TO CAUSE THERMAL DESTRUCTION OF THE CONTAMINANTS. IN AN AFTERBURNER THE DESTRUCTION BY-PRODUCTS ARE OXIDIZED TO PRODUCE SAFE PRODUCTS OF CARBON DIOXIDE, WATER VAPOR, HYDROCHLORIC ACID, ETC. FINALLY, TO ASSURE OVERALL SAFETY, THE GASES ARE SUBJECTED TO AQUEOUS AND CHEMICAL SCRUBBING.

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INNOVATIVE INFORMATIONN SYSTEMS INC
6033 W CENTURY BLVD - #720
LOS ANGELES, CA 90045
CONTRACT NUMBER:
BRENT ELDER
TITLE:
LASER PROJECTION FOR TESTING AIR DELIVERABLE CONVENTIONAL MUNITIO AND ARMAMENTS
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23270

CONTROLLED LABORATORY SENSOR TESTING USING SCENE PROJECTION REDUCES SENSOR EVALUATION COSTS BY REDUCING FLIGHT TEST REQUIREMENTS YET PROVIDING ACTUAL SCENE STIMULATION OF A SENSOR. IIS HAS DEVELOPED A MATURE LASER PROJECTION TECHNOLOGY AND IIS HAS RESOLVED, THROUGH ANALYSIS AND TEST, MANY TECHNICAL ISSUES ASSOCIATED WITH IR SENSOR TESTING. IIS HAS BUILT A PROTOTYPE PROJECTOR IN THE VISIBLE SPECTRUM SHOWING FEASIBILITY OF THE CONCEPT BY PRODUCING 1500:1 DYNAMIC RANGE, 200 FRAMES PER SECOND FRAME RATE, FLEXIBLE INPUT FORMAT, AND BAND FLEXIBILITY. THE TECHNICAL EFFORT UNDERTAKEN FOR THE SBIR IS TO INCREASE PROJECTION FRAME RATE TO 1000 Hz FROM 64 x 64 PIXEL IMAGE, AND REDUCE RISK OF THE IR DESIGN BY CHARACTERIZING COMPONENTS IN ACTUAL OPERATIONS. THIS INCLUDES AUGMENTING THE SCANNER, DATA SUPPLY ELECTRONICS, AND BEAM DELIVERY OPTICS. THE VISUAL PROJECTOR WILL FORM A MODULE WHICH WILL BE SIMILAR TO THE BASIC BUILDING BLOCK OF THE IR PROJECTOR.

INNOVATIVE SCIENCES INC
400 HESTER ST
SAN LEANDRO, CA 94577
CONTRACT NUMBER:
BRUCE W MAXFIELD
TITLE:
AN INSTRUMENT FOR DAMAGE ASSESSMENT OF REINFORCED CONCRETE STRUCTURES
TOPIC# 186 OFFICE: AFWL IDENT#: 27140

QUITE RECENTLY, IT HAS BEEN SHOWN THAT THE IMPACT-ECHO (IE) METHOD

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CAN YIELD A GREAT DEAL OF INFORMATION ABOUT THE INTERNAL STRUCTURE OF CONCRETE, INCLUDING THE PRESENCE OF CRACKING AND DISBONDED REINFORCING MATERIAL. CAREFUL EXAMINATION OF THE IE METHOD, HOWEVER, SHOWS THAT UNDER MANY CIRCUMSTANCES IT CAN BE VERY DIFFICULT TO INVERT THE RESULTS IN ORDER TO OBTAIN QUANTITATIVE INFORMATION ABOUT THE INTERNAL STRUCTURE. MUCH OF THE AMBIGUITY IN ANY DATA INVERSION PROCEDURE CAN BE REMOVED BY PLACING ADDITIONAL CONSTRAINTS ON THE INVERSION. THIS PROPOSAL SEEKS SUPPORT TO PERFORM FINITE ELEMENT (FE) CALCULATIONS IN ORDER TO CALCULATE THE IE RESPONSE FOR SEVERAL MODEL STRUCTURES CONTAINING CRACKS AND DISBONDED REINFORCING MATERIAL. THESE RESULTS WILL THEN BE INVERTED USING NO A PRIORI KNOWLEDGE OF THE INTERNAL STRUCTURE OR THICKNESS. IN MANY CASES, THIS WILL LEAD TO A VERY POOR QUANTITATIVE INVERSION. INCORPORATING ADDITIONAL INFORMATION ABOUT THE STRUCTURE FROM OTHER NONDESTRUCTIVE MEASUREMENTS SUCH AS MAGNETIC, ELECTROMAGNETIC AND NUCLEAR METHODS WILL BE USED TO IMPROVE INVERSION OF IE RESPONSES.

INSULATING MATERIALS INC
1 CAMPBELL RD
ROTTERDAM, NY 12306
CONTRACT NUMBER:
MARK MARKOVITZ
TITLE:
CONTROLLABLE REACTIVITY EPOXY RESINS FOR COMPOSITES REPAIRS
TOPIC# 140 OFFICE: AFWAL/ASD IDENT#: 26984

THIS PROJECT WILL DEVELOP RAPID CURING, HEAT RESISTANT, SOLVENTLESS NOVOLAC AND CYCLOALIPHATIC EPOXIES WITH CURING BASED ON TITANATE ESTERS AND METAL ACETYLACETONATE CATALYSTS FOR THE STRUCTURAL REPAIR OF THERMOSETTING COMPOSITES. THE CURE WILL BE CATIONIC ACID-TYPE POLYMERIZATION. THE REPAIR RESINS WILL BE BASED ON EPOXY CHEMISTRY KNOWN TO YIELD ADHESIVES AND PREPREGS FOR LONG TERM CONTINUOUS USE AT ELEVATED TEMPERATURES. ANALOGOUS MATERIALS HAVE BEEN SUCCESSFULLY USED FOR ROTATING ELECTRICAL MACHINERY SUCH AS AIRCRAFT GENERATORS IN THE F-15. NO AMINES OR CORROSIVE HALOGEN-CONTAINING COMPOUNDS WILL BE USED. THE REPAIR RESINS WILL BE BASED ON STABLE, TWO-PART SYSTEMS IN WHICH THE CATALYST PLUS EPOXY WILL BE IN ONE PART AND THE ACCELERATOR PLUS EPOXY IN THE SECOND PART. THE REACTIVITY CAN BE CONTROLLED BY THE TYPE AND AMOUNT OF THE ACCELERATOR. RHEOLOGICAL

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PROPERTIES CAN BE CONTROLLED WITH HEAT RESISTANT REACTIVE DILUENTS DEVELOPED FOR THE POLYMERIZATION CHEMISTRY. ADDITIONAL WORK USING DYNAMIC MECHANICAL ANALYSIS (DMA) AND DIFFERENTIAL SCANNING CALORIMETRY (DSC) WILL BE DONE AND RESULTS USED TO OPTIMIZE CURED MECHANICAL PROPERTIES OF THE REPAIR RESINS. A FINAL PHASE OF THIS PROGRAM WILL INVOLVE CONTACT WITH AIR FORCE REPRESENTATIVES TO DEVELOP THE RANGE OF APPLICATION REQUIREMENTS AND COMPOSITE SUBSTRATES FOR THIS TYPE OF REPAIR.

INTEGRATED PARALLEL TECHNOLOGY INC
51 E CAMPBELL AVE - STE 106H
CAMPBELL, CA 95008
CONTRACT NUMBER:
DR SIDDHARTH C BHATT
TITLE:
AUTOMATED INTEGRATED EXPERT COMPUTER SYSTEM ARCHITECTURE APPLICATION TO TARGET VULNERABILITY ASSESSMENT
TOPIC# 20 OFFICE: AD/PMR IDENT#: 23417

A RULE AND DATA DRIVEN, AUTOMATED AND INTEGRATED COMPUTER EXPERT SYSTEM ARCHITECTURE IS PROPOSED TO GREATLY REDUCE TIME SPENT PERFORMING TARGET VULNERABILITY ASSESSMENT AND TO FACILITATE INEXPERIENCED VULNERABILITY ASSESSMENT COMPUTER CODE USERS BY APPLYING THE EXPERT SYSTEM EMBEDDED KNOWLEDGE BASED PROGRAMS BUILT UPON THE SKILLED VULNERABILITY ASSESSMENT ANALYST EXPERIENCE AND EXECUTING ON LOW COST 32-BIT PROCESSOR BASED PORTABLE PERSONAL COMPUTER WITH GRAPHIC USER INTERFACE. THE PROPOSED PROTOTYPE EXPERT SYSTEM KNOWLEDGE BASE DEVELOPMENT IS LIMITED TO BUILDING TARGET VULNERABILITY ASSESSMENT APPLICATION FOR DEMONSTRATING THE PROPOSED CONCEPT. THE EXPERT SYSTEM CONCEPT IS ALSO APPLICABLE TO OTHER U.S. AIR FORCE APPLICATIONS.

INTELLIGENT AUTOMATION SYSTEMS INC
13 WEST ST
MALDEN, MA 02148
CONTRACT NUMBER:
DR STEVEN J GORDON
TITLE:
A MACHINE VISION SYSTEM FOR THRUST STAND MOTION VISUALIZATION
TOPIC# 25 OFFICE: AEDC/DOT IDENT#: 28591

SUBMITTED BY

THIS PROPOSAL DESCRIBES A PROJECT TO DEVELOP AN INSTRUMENT WHICH MEASURES AND DISPLAYS THE RELATIVE MOTION OF STRUCTURAL COMPONENTS OF A THRUST STAND AND TURBINE ENGINE. THE OBJECTIVES OF THIS STUDY ARE TO DEFINE THE MEASUREMENT PROBLEM CONSTRAINTS, DESIGN A METHODOLOGY FOR MAKING THE MEASUREMENTS, STUDY THE ACCURACY OF THE PROPOSED MEASURING SYSTEM, DESIGN AND IMPLEMENT A PROTOTYPE MACHINE VISION SYSTEM AND PROTOTYPE TARGET, AND DETERMINE THE BANDWIDTH OF POSITION MEASURMENTS USING A PROTOTYPE SYSTEM. THE PROPOSED MEASUREMENT SYSTEM CONSISTS OF A SOLID STATE VIDEO CAMERA, MULTIPLE TARGETS WHICH ARE PLACED ON THE VARIOUS STRUCTURAL COMPONENTS BEING MEASURED, AND IMAGE PROCESSING HARDWARE AND SOFTWARE. THE DESIGN FEASIBILITY AND DESIGN PARAMETERS OF THE MEASUREMENT SYSTEM WILL BE STUDIED THROUGH A PROBABILISTIC ANALYSIS OF THE ACCURAY OF MEASUREMENTS MADE FROM DISCRETE ARRAY SENSORS (SOLID STATE VIDEO CAMERAS). A LABORATORY PROTOTYPE SENSOR AND TARGET WILL BE DEVELOPED AND TESTED TO PROVIDE ADDITIONAL SYSTEM DESIGN DATA.

INTELLIGENT SYSTEMS DESIGN INC
15400 SE 30TH PL - NCR CENTER/STE 101
BELLEVUE, WA 98007
CONTRACT NUMBER:
STANLEY R PATTON
TITLE:
KNOWLEDGE BASED SYSTEMS FOR AUTOMATED TRAINING DEVELOPMENT
TOPIC# 63 OFFICE: AFHRL/HSD IDENT#: 26874

BY INTEGRATING THE POWER OF COMPUTER, INSTRUCTIONAL DESIGN AND KNOWLEDGE PROCESSING TECHNOLOGIES INTO ONE SEEMLESS FUNCTIONAL OPERATING SYSTEM, IT IS NOW POSSIBLE TO DEVELOP AND IMPLEMENT AN INEXPENSIVE MICROCOMPUTER-BASED WORKSTATION. BY EMBEDDING THE HEURISTIC STRUCTURES OF INSTRUCTIONAL AND KNOWLEDGE PROCESSING ROUTINES INTO THE SYSTEM, AUTOMATION OF THE INTERSERVICE INSTRUCTIONAL SYSTEMS DEVELOPMENT PROCESS IS NOW POSSIBLE. ADDITIONALLY, BY LINKING TO AN INTEGRATING MILITARY OCCUPATIONAL AND MANPOWER DATA BASES INTO THE SYSTEM PROVIDES FOR THE CONSTRUCTION OF VISUAL-KNOWLEDGE BASES WHICH CAN SUPPORT THE WEAPONS SYSTEM ACQUISITION PROCESS, THEREBY INTEGRATING IMPORTANT MANPOWER, PERSONNEL AND TRAINING FUNCTIONS.

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INTERACTIVE INTELLIGENT IMAGERY CORP
2023 GORDON AVE
MENLO PARK, CA 94025
CONTRACT NUMBER:
PATRICK E MOORE
TITLE:
OPTICAL SENSOR WITH HIGH DIRECTIONAL RESOLUTION
TOPIC# 184 OFFICE: AFWL IDENT#: 27137

I3C PROPOSES TO USE ITS EXPERIENCE IN FIBER OPTICS AND MONOPULSE DIRECTION FINDING SYSTEM DEVELOPMENT TO DESIGN A SENSOR THAT WILL HAVE EXCEPTIONALLY HIGH PROBABILITY OF DETECTION OF INTERMITTANT POINT SOURCES OF LIGHT ENERGY. BY INTEGRATING MANY INDIVIDUAL LENS/ DETECTOR ELEMENTS INTERCONNECTED BY OPTICAL FIBERS, THE SENSOR WILL BE ABLE TO RESOLVE SEPARATE SOURCES TO A VERY SMALL FRACTION OF A DEGREE IN ANGLE OF ARRIVAL OF THE LIGHT ENERGY. THE DESIGN WILL PROVIDE FOR MULTIPLE WAVELENGTH DETECTION AND FULLY AUTOMATED (ELECTRONIC) ANGLE CALCULATION (USING WELL KNOWN AMPLITUDE COMPARISON TECHNIQUES) AND SIMPLE ABILITY TO TRACK RELATIVE MOTION OF A RAPIDLY MOVING SOURCE. OUR RESEARCH WILL NOT ONLY TRADE SEVERAL PARAMETERS SUCH AS SENSITIVITY, RESOLUTION, NUMBER OF LENS/DETECTOR ELEMENTS FOR TWO Pi STERADIAN INSTANTANEOUS COVERAGE, BUT WILL INCLUDE EXPERIMENTAL DATA FROM A LIMITED FIELD OF VIEW BREADBOARD WE WILL FABRICATE AND TEST DURING PHASE I. A DETAILED PLAN FOR DEVELOPMENT AND TEST OF FULL SCALE PROTOTYPE OF A LIGHT WEIGHT SENSOR FOR FLIGHT TESTING WILL BE DEVELOPED. OUR RESEARCH ALSO ADDRESSES THE ISSUE OF PRODUCEABILITY AND RELIABILITY OF THE OPTICAL ELEMENTS PLUS THE CONCEPT OF AN INTEGRATED PROCESSOR FOR CORRELATION OF DETECTED EVENS WITH THEIR RELATIVE POSITIONS.

INTERNATIONAL INFORMATION SYSTEMS INC
802 WOODWARD RD
MARSHALL, VA 22115
CONTRACT NUMBER:
DR GERALD W HOPPLE
TITLE:
NEXT GENERATION HUMAN FACTORS ENGINEERING: NEW KNOWLEDGE STRUCTUR BASED ARCHITECTURES FOR MAN-MACHINE INTERFACE/COMPUTER-BASED TRAI
TOPIC# 63 OFFICE: AAMRL/HSD IDENT#: 26861

SUBMITTED BY

THERE IS A NEED TO DESIGN, DEVELOP, TEST AND IMPLEMENT INNOVATIVE HUMAN-RELATED SYSTEMS AND SUBSYSTEMS FOR AEROSPACE APPLICATIONS. INTELLIGENT INTERFACE TECHNOLOGY, KNOWLEDGE-BASED SYSTEMS, MENTAL MODELS, AND OTHER ADVANCED COGNITIVE TOOLS AND CONCEPTS CAN BE VIEWED AS A MEANS TO ACHIEVE THESE ENDS. OPPORTUNITIES NOW EXIST FOR THE APPLICATION OF ADVANCED APPROACHES AND SYSTEM ARCHITECTURAL PRINCIPLES TO A VARIETY OF MAN-MACHINE INTERFACE AND COMPUTER-BASED TRAINING PROBLEMS. THE PROJECT WILL IDENTIFY AN APPROPRIATE DOMAIN (FOR EXAMPLE, LOGISTICS PLANNING) AND THEN MODEL THE RELEVANT PROCESS, DESIGN A COMPUTER-BASED PROTOTYPE (IN AN INTERACTIVE "STORYBOARD") TO DEMONSTRATE ASPECTS OF AN ADVANCED SYSTEMS CONCEPT BASED ON NEW KNOWLEDGE STRUCTURES AND KNOWLEDGE STRUCTURE ARCHITECTURES. THE PROTOTYPE WILL ALSO BE EVALUATED TO DETERMINE ITS "VALUE-ADDED."

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER:
DR KENNETH ABEND
TITLE:
SIDELOBE REDUCTION AND CLUTTER SUPPRESSION FOR A DISTRIBUTED SPARSE ARRAY (DSA) RADAR SYSTEM
TOPIC# 166 OFFICE: AFSD IDENT#: 27107

THE FULL PERFORMANCE CAPABILITY OF A SPACE BASED DISTRIBUTED SPARSE ARRAY (DSA) CAN BE ACHIEVED ONLY IF TECHNIQUES ARE DEVELOPED THAT SUPPRESS CLUTTER RETURNS AND THE EFFECT OF JAMMING IN THE DSA SIDELOBES. THE PROPOSED PROGRAM PRESENTS FOUR TECHNIQUES FOR SUPPRESSING THE DSA SIDELOBE CLUTTER WHILE AT THE SAME TIME MAINTAINING DSA AREA COVERAGE RATE, MINIMIZING THE NUMBER OF INDIVIDUAL MINIRADARS IN A DSA CONSTELLATION, AND MAINTAINING THE HIGH RESOLUTION AND SURVIVABILITY OF THE DSA. COMPLEMENTARY TECHNIQUES FOR SUPPRESSING JAMMING IN THE INDIVIDUAL RADAR WIDE MAINBEAM FOOTPRINT AND THE OVERALL DSA RESULTING SIDELOBE PATTERN ARE PRESENTED. A PRELIMINARY DESIGN OF A GROUND BASED EXPERIMENT IN PHASE II HAS BEEN DEVELOPED.

IONWERKS
2215 ADDISON
HOUSTON, TX 77030
CONTRACT NUMBER:
J ALBERT SCHULTZ
TITLE:
SYNTHESIS IN HIGH T(c) SUPERCONDUCTORS REQUIRING NO POST-ANNEAL
TOPIC# 117 OFFICE: AFWAL/ASD IDENT#: 26953

SUBMITTED BY

WE WILL EXPLORE THE POSSIBILITY OF FABRICATING SUPERCONDUCTOR MATERIAL USING LOW ENERGY ION BEAM TECHNIQUES. THE GOAL WILL BE BOTH TO IMPROVE THE EPITAXIAL GROWTH OF SUPERCONDUCTOR THIN FILMS ON SUBSTRATES AND TO REMOVE THE NECESSITY OF HARSH POST-ANNEALLING IN OXYGEN AMBIENTS.

IRVINE SENSORS CORP
3001 REDHILL AVE - BLDG III/STE 208
COSTA MESA, CA 92626
CONTRACT NUMBER:
DAVID E LUDWIG
TITLE:
PASSIVE AIR-TO-AIR MISSILE SEEKER
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23275

IRVINE SENSORS PROPOSES THE DEMONSTRATION OF A HYMOSS MODULE WITH DYNAMIC STARE AS A MISSILE SEEKER APPROACH CAPABLE OF EXTRACTING, ACQUIRING AND TRACKING TARGETS IN THE PRESENCE OF HIGHLY STRUCTURED AND DYNAMIC BACKGROUNDS. IT IS APPLICABLE TO MANY MISSIONS, BUT IN PARTICULAR TO THE NEXT GENERATION AMRAM. DYNAMIC STARE IS AN APPROACH TO IR IMAGING WHICH USES A SCANNED IMAGE AND A Z-TECHNOLOGY FPA TO PUT INTRAFRAME AND INTERFRAME IMAGE PROCESSING ON THE FOCAL PLANE. IT ALLOWS ON-FOCAL PLAN EXTRACTION OF LOW OBSERVABLES FROM HIGHLY CLUTTERED, MOVING BACKGROUNDS. NORMAL MISSILE BODY MOTION IS USED TO GENERATE THE DITHER SCAN, NEGATING THE NEED FOR SCANNING OPTICS. DATA RATES AND OFF-FOCAL PLANE PROCESSING LOADS ARE REDUCED SUFFICIENTLY TO ELIMINATE THEM AS MAJOR ISSUES IN THE SEEKER DESIGN. THE PROPOSED PHASE I PROGRAM IS THE DETERMINATION OF SCENARIO LIMITS WITHIN WHICH THE SYSTEM WILL SUCCESSFULLY ACQUIRE AND TRACK TARGETS, AND THE CONCEPTUAL DESIGN OF A SEEKER WHICH MEETS THE PACKAGING AND ENVIRONMENTAL CONSTRAINTS POSED BY AN AIR-TO-AIR MISSILE PLATFORM. PHASE II IS THE DESIGN AND FABRICATION OF A LABORATORY DEMONSTRATION OF THE CRITICAL FUNCTIONS OF THE INTEGRATED CIRCUIT FUNCTIONS OF THE INTEGRATED CIRCUIT INCORPORATING DYNAMIC STARE.

ISOTHERMAL SYSTEMS RESEARCH
363 BUCOTO CT
LEXINGTON, KY 40504
CONTRACT NUMBER:
DONALD TILTON
TITLE:
CLOSED SYSTEM HIGH FLUX EVAPORATIVE SPRAY COOLING
TOPIC# 121 OFFICE: AFWAL/ASD IDENT#: 26959

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ISR PROPOSES TO CONDUCT A PROOF-OF-CONCEPT STUDY OF A UNIQUE HIGH-FLUX TWO-PHASE THERMAL MANAGEMENT SYSTEM FOR SPACECRAFT. THIS SYSTEM COUPLES HIGH POWER DENSITY EVAPORATIVE SPRAY COOLING WITH AN EXPANDABLE VAPOR STORAGE AND CONDENSATION DEVICE. PREVIOUS WORK HAS DEMONSTRATED THE IMMENSE POTENTIAL OF EVAPORATIVE SPRAY COOLING FOR REMOVING EXTREMELY HIGH HEAT FLUXES (~1000 W/cm[2]) WITH VERY SMALL TEMPERATURE DIFFERENCES (<50 DEG C). HOWEVER, ALL OF THE PREVIOUS EXPERIMENTAL WORKS HAVE UTILIZED OPEN SYSTEMS CONTAINING AIR. A CLOSED, SINGLE WORKING FLUID SYSTEM IS REQUIRED FOR ACTUAL SPACECRAFT THERMAL MANAGEMENT APPLICATIONS. THIS PROPOSAL PRESENTS A DESIGN FOR A CLOSED SYSTEM EVAPORATIVE COOLING APPARATUS AND OUTLINES A PRELIMINARY TEST PLAN. THE DESIGN IN CORPORATES NOVEL METHODS OF SPRAY CONTROL AND HEATING. THIS WILL FACILITATE THE DETERMINATION OF BOTH THE MAXIMUM ATTAINABLE HEAT FLUX AND THE IDEAL RANGE OF SPRAY PARAMETERS FOR A GIVEN HEAT FLUX. THE SYSTEM WILL ALLOW PRECISE CONTROL OVER HEAT INPUT OR INDEPENDENT CONTROL OF THE SURFACE TEMPERATURE TO CAREFULLY STUDY CRITICAL HEAT FLUX CONDITIONS. BASED ON PREVIOUS RESEARCH CONDUCTED BY THE PRINCIPAL INVESTIGATOR, IT IS EXPECTED THAT THIS COOLING METHOD WILL PROVIDE HEAT REMOVAL RATES IN EXCESS OF 1000 W/cm(2).

J.B.S. TECHNOLOGIES INC
631 KENDALE LN
THOUSAND OAKS, CA 91360
CONTRACT NUMBER:
JEFFREY B SHELLAN
TITLE:
RAPID FABRICATION OF COMPLEX INTEGRATED CIRCUITS USING LASER PANTOGRAPHY
TOPIC# 80 OFFICE: AFWAL/ASD IDENT#: 26900

THE PURPOSE OF THE PROPOSED PROGRAM IS TO DESIGN AN ELECTRO-OPTIC SYSTEM THAT WILL ALLOW THE RAPID PARALLEL PROCESSING OF INTEGRATED CIRCUITS (ICs) WITH FOCUSED LASER BEAMS. CURRENT LASER PANTOGRAPH (LP) SYSTEMS, WHICH HAVE BEEN USED TO SUCCESSFULLY FABRICATE OR MODIFY ICs, USE A SINGLE FOCUSED BEAM TO SCAN THE IC. THIS PROCESS IS TOO SLOW TO BE OF SIGNIFICANT COMMERCIAL USE. THE GOAL OF THE PROPOSED PROGRAM IS TO DESIGN AN ELECTRO-OPTIC MASK THAT ALLOWS

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NUMEROUS FOCUSED LASER BEAMS (~100) TO SIMULTANEOUSLY IRRADIATE THE IC AND THUS GREATLY SPEED UP THE LASER WRITING PROCESS TO THE POINT WHERE IT OFFERS BENEFITS OVER CONVENTIONAL IC FABRICATION METHODS FOR SOME APPLICATIONS. SEVERAL ELECTRO-OPTIC SYSTEMS, DEVELOPED IN OTHER PROGRAMS, WILL BE INVESTIGATED FOR APPLICATION IN THE LP FIELD. THESE SPATIAL LIGHT MODULATORS WILL BE ANALYZED SO THAT THEY CAN BE RATED ACCORDING TO COMPLEXITY, AVAILABILITY OF HARDWARE, COST, LASER DAMAGE, RISK, AND PROCESSING RATE POTENTIAL. THE MOST ATTRACTIVE CONCEPT WILL BE REDESIGNED TO SATISFY THE 100 SPOT DEFLECTION GOAL OF THE PROGRAM. THE CONCEPT WILL BE FABRICATED AND TESTED IN PHASE II.

JORDAN & ASSOCS
PO BOX 22605
KNOXVILLE, TN 37933
CONTRACT NUMBER:
MICHAEL F JORDAN
TITLE:
SYSTEMS LEVEL TECHNOLOGY ASSESSMENT METHODOLOGY FOR STOVL TYPE AIRCRAFT
TOPIC# 92 OFFICE: AFWAL/ASD IDENT#: 26916

THIS PROJECT WILL RESULT IN THE RECOMMENDATION OF A TECHNIQUE TO BE USED FOR THE PURPOSE OF EVALUATING THE UTILITY OF STOL/STOVL TYPE AIRCRAFT IN VARIOUS OPERATIONAL SCENARIOS. THE STUDY EFFORT WILL INCLUDE A SURVEY OF PREVIOUS AND ONGOING STUDIES TO IDENTIFY POTENTIAL METHODOLOGIES, AN EVALUATION OF THOSE IDENTIFIED, AND RECOMMENDATION OF AN OPTIMUM TECHNIQUE. A SUGGESTED PHASE II STUDY PLAN WILL BE INCLUDED AS A DELIVERABLE.

KEO CONSULTANTS
27 IRVING ST
BROOKLINE, MA 02146
CONTRACT NUMBER:
ROBERT H EATHER
TITLE:
MINIATURE IMAGING PHOTOMETER FOR AURORA AND AIRGLOW
TOPIC# 179 OFFICE: AFGL IDENT#: 27128

SUBMITTED BY

KEO CONSULTANTS WILL DESIGN A MINIATURE, EASILY PORTABLE IMAGING PHOTOMETER CAPABLE OF PERFORMING HIGH-SENSITIVITY MONOCHROMATIC MEASUREMENTS OF LOW-LIGHT-LEVEL AURORAL AND AIRGLOW EMISSIONS. PHASE I EFFORTS WILL INVOLVE DEFINING REQUIRED OPERATIONAL PARAMETERS (THROUGH CONSULTATION WITH AIR FORCE RESEARCHERS), AND THEN THE APPLICATION OF OUR PREVIOUS EXPERIENCE AND EXPERTISE IN THIS AREA TO OPTIMIZE OPTICS, IMAGE INTENSIFICATION, CCD DETECTION, AND IMAGE ACQUISITION AND RECORDING SOFTWARE AND HARDWARE, SO AS TO BEST MEET SCIENTIFIC OBJECTIVES. THIS CONCEPTURAL DEVELOPMENT WILL IDENTIFY KEY HARDWARE COMPONENTS, AND INCLUDE DOCUMENTED RATIONALE FOR OUR SELECTIONS. NO HARDWARE WILL BE PURCHASED IN PHASE I, BUT DESIGN WILL BE TAKEN TO A POINT WHEREBY WE COULD BEGIN IMMEDIATE PROCUREMENT AND CONSTRUCTION IN PHASE II. WE ENVISAGE THIS EFFORT AS PRIMARILY DIRECTED TOWARDS A GROUND-BASED INSTRUMENT, OR ONE ALSO SUITABLE FOR USE IN RESEARCH AIRCRAFT. WE WILL ALSO STUDY WITH AIR FORCE RESEARCHERS POSSIBLE SPACE SHUTTLE OPPORTUNITIES, AND IF REQUESTED WILL PURSUE PROBLEMS ASSOCIATED WITH SPACE QUALIFICATION, AND ESTIMATE COSTS. WE WOULD EXPECT ANY SHUTTLE INSTRUMENT WOULD HAVE TO BE DEVELOPED SEPARATELY, BASED ON EXPERIENCE AND PERFORMANCE OF THE GROUND-BASED INSTRUMENT.

KETRON INC
350 TECHNOLOGY DR
MALVERN, PA 19355
CONTRACT NUMBER:
ANDRAS SPIEGEL
TITLE:
ARTICULATED TOTAL BODY (ATB) BIODYNAMIC MODELING
TOPIC# 72 OFFICE: AAMRL/HSD IDENT#: 26886

THE ARTICULATED TOTAL BODY (ATB) MODEL WAS ORIGINALLY CONCEIVED AS A RESEARCH TOOL TO REDUCE SEVERITY OF INJURY TO MOTOR VEHICLE CRASH VICTIMS. THIS SAME THEME WAS REITERATED BY AIR FORCE RESEARCH PERSONNEL WHO APPLY IT TO THE STUDY OF AIRCREW-MEMBERS DURING EMERGENCY EJECTION FROM AIRCRAFT IN FLIGHT. IN BOTH APPLICATIONS, THE USE OF MODELING IS PARTICULARLY ATTRACTIVE SINCE IT REDUCES RISK AND COST ASSOCIATED WITH ACTUAL TESTING. FURTHERMORE, THE MODEL SUPPORTS SYSTEM EVALUATIONS UNDER OPERATING CONDITIONS THAT WOULD OTHERWISE

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BE INFEASIBLE TO TEST WITH HUMAN SUBJECTS. PRESENTLY THE ATB MODEL RUNS ON EITHER A MAINFRAME COMPUTER OR A HIGHLY SPECIALIZED MINI-COMPUTER. A PRINCIPAL GOAL OF THIS PROJECT IS TO DEVELOP A VERSION OF THE ATB MODEL THAT CAN RUN ON PC SYSTEMS, THEREBY MAKING IT AVAILABLE TO INVESTIGATORS WITH LIMITED COMPUTER RESOURCES BOTH IN GOVERNMENT AND INDUSTRY.

KJS ASSOCS
1712 SPRINGFIELD ST
DAYTON, OH 45403
CONTRACT NUMBER:
REINHOLD M W STRNAT
TITLE:
A SURVEY OF THE CURRENT STATE-OF-THE-ART IN HIGH-ENERGY-PRODUCT PERMANENT MAGNETS
TOPIC# 122 OFFICE: AFWAL/ASD IDENT#: 26961

PERMANENT MAGNETS (PM'S) ARE A KEY COMPONENT IN MANY OF TODAY'S MILITARY AND COMMERCIAL ELECTRICAL/ELECTRONIC DEVICES AND SUBSYSTEMS. APPLICATIONS INCLUDE MM AND MICROWAVE POWER TUBES FOR COMMUNICATIONS, AIRCRAFT/AEROSPACE VEHICLE CONTROL SURFACE ACTUATORS, AIRBORNE POWER SYSTEMS, AND INERTIAL GUIDANCE/STABILIZATION SYSTEMS. THE PUSH IN ALL OF THESE AREAS IS FOR HIGHER PERFORMANCE IN SMALLER PACKAGES; ADDITIONALLY, DEVICES ARE BEING USED IN EVER HARSHER ENVIRONMENTS, MOST NOTABLY AT TEMPERATURE EXTREMES OF HEAT AND COLD. UNDER THOSE CONDITIONS, EVEN THE BEST PM MATERIALS CAN RUN INTO SOME SEVERELY RESTRICTIVE LIMITS, AND THE NEEDED QUANTITATIVE INFORMATION ON MAGNETIC PROPERTIES AND STABILITY UNDER SUCH CONDITIONS IS STILL LARGELY UNAVAILABLE, KJC ASSOCIATES PROPOSES TO IDENTIFY IN DETAIL THE MAGNETIC CHARACTERISTICS WHICH ARE AND MAY SOON BE REQUIRED OF HIGH-ENERGY PERMANENT MAGNETS (HEPM'S) BY REVIEWING THE SCIENTIFIC LITERATURE AND TALKING TO DESIGN ENGINEERS. THE RESULT WOULD BE A HEPM "SPECIFICATION" WITH A VIEW TOWARD PRESENT AND FUTURE (10 YEARS) MAGNETIC MATERIALS NEEDS. WE PLAN TO SURVEY THE CURRENT STATE OF PRODUCTION TECHNOLOGY AND ACTIVE R&D PROJECTS OF HEPM'S, WITH EMPHASIS ON ELEVATED TEMPERATURE BEHAVIOR. EXISTING MATERIALS WHICH MAY ALREADY MEET OUR "SPECIFICATION" WILL BE OBTAINED AND MAGNETICALLY CHARACTERIZED TO THE LIMITS DETERMINED BY OUR SPECIFICATION (AT LEAST -196 TO 300 DEG C).

SUBMITTED BY

KLEIN ASSOCS INC
PO BOX 264
YELLOW SPRINGS, OH 45387
CONTRACT NUMBER:
GARY A KLEIN
TITLE:
A CASE-BASED REASONING SYSTEM FOR INTELLIGENT STRUCTURED SOFTWARE DEVELOPMENT
TOPIC# 149 OFFICE: AFWAL/ASD IDENT#: 27009

THE OBJECTIVE IS TO DEVELOP A KNOWLEDGE-BASED ASSISTANT FOR THE SOFTWARE ENGINEERING (SE) PROCESS. A CASE-BASED-REASONING (CBR) APPROACH TO KNOWLEDGE ELICITATION IS PROPOSED AS A SENSITIVE AND EFFECTIVE STRATEGY TO DERIVE AND REPRESENT CRITICAL KNOWLEDGE. PHASE I WILL DEMONSTRATE THE FEASIBILITY OF USING A CBR APPROACH TO DEVELOPING A KNOWLEDGE-BASED ASSISTANT FOR THE EXTENSIVE AND COMPLEX TASKS ASSOCIATED WITH SOFTWARE ENGINEERING EFFORTS. CASE TOOLS HAVE BEEN BUILT TO ASSIST IN A PORTION OF THE SOFTWARE ENGINEERING PROCESS, BUT HAVE BEEN LIMITED IN RESULTS BY THEIR VIEW OF THE REQUIREMENTS NEEDED FOR DOMAIN SPECIFIC PROBLEMS. A KNOWLEDGE-BASED ASSISTANT IS REQUIRED TO PROVIDE THE EXPERIENCE OF SEs IN A STRUCTURED, AND ENCAPSULATED FORMAT. THROUGH PROPER ELICITATION TECHNIQUES A CASE-BASE OF PRIOR EXPERIENCES CAN BE DEVELOPED TO PRODUCE A CBR SYSTEM. THIS SYSTEM CAN PROVIDE A CLASSIFICATION STRUCTURE FOR BOTH THE FORMAL AND INFORMAL METHODS USED BY SEs TO DESIGN, IMPLEMENT, AND TEST SOFTWARE DESIGNS.

KLM TECHNOLOGIES INC
1501 N BROADWAY - STE 250
WALNUT CREEK, CA 94596
CONTRACT NUMBER:
B GEORGE KNIAZEWYCZ
TITLE:
DEVELOPMENT OF A DISPOSABLE CHEMOTHERAPEUTIC WASTE PROCESSING SYS
TOPIC# 60 OFFICE: AFESC/RDXP IDENT#: 23232

KLM TECHNOLOGIES PROPOSES A NEW APPROACH TO SELECTED WASTE HANDLING,

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PROCESSING AND DISPOSAL PROBLEMS, I.E., THE DISPOSAL WASTE PROCESSING SYSTEM. KLM RECOGNIZES THAT HOSPITAL WASTE GENERATORS GENERATE AND TREAT VARIOUS WASTE STREAMS ON A REGULAR BASIS WHICH MAY BE HANDLED BY CONVENTIONAL INSTALLED EQUIPMENT. HOWEVER, INFREQUENT WASTES SUCH AS CHEMOTHERAPEUTIC AGENT CONTAMINATED WASTE ARE A SERIOUS PROBLEM BECAUSE OF THE NEED FOR COST EFFECTIVE AND PROMPT RESPONSE. VARIOUS DOCUMENTS HAVE DEFINED THE PROBLEMS ENCOUNTERED WITH DISPOSAL OF VARIOUS TOXIC AND HAZARDOUS WASTES. THESE PROBLEMS INCLUDE WASTE COLLECTION, PROCESSING, IMMOBILIZATION, AND EVENTUAL DISPOSAL. KLM HAS CAREFULLY EXAMINED THIS PROBLEM AREA AND PROPOSED THE DEVELOPMENT OF "INEXPENSIVE"DISPOSAL SYSTEMS WHICH INCORPORATE ADVANCED UNIT OPERATIONS TECHNOLOGY INTO DISPOSAL WASTE CONTAINERS. THIS EFFORT MAY EVENTUALLY RESULT IN A NUMBER OF DIFFERENT PROCESSES SUCH AS BEING INCORPORATED INTO DISPOSABLE PROCESS EQUIPMENT SYSTEMS, THE INITIAL EFFORT WILL INVOLVE THE DEVELOPMENT OF A DISPOSAL SYSTEM. THIS TECHNOLOGY IS BASED UPON KLM'S ADVANCED WASTE CONTAINER TECHNOLOGY, HIGH INTEGRITY CONTAINMENT SYSTEM (HICS), WHICH WILL BE CAPABLE OF HANDLING DIFFICULT AND UNIQUE WASTE.

KMS FUSION INC
PO BOX 1567 - 3853 RESEARCH PARK DR
ANN ARBOR, MI 48106
CONTRACT NUMBER:
JAMES G DOWNWARD
TITLE:
REAL-TIME FLOW VISUALIZATION SYSTEM
TOPIC# 102 OFFICE: AFWAL/ASD IDENT#: 26929

LASER HOLOGRAPHIC INTERFEROMETRY IS AN IMPORTANT TOOL FOR AERODYNAMIC RESEARCH BECAUSE INTERFEROGRAMS PROVIDE QUANTITATIVE MEASUREMENTS OF THE FLOW FIELD SURROUNDING WIND TUNNEL MODELS. HOWEVER, UNTIL RECENTLY, ROUTINE USE OF HOLOGRAPHIC INTERFEROMETRY HAS BEEN IMPRACTICAL BECAUSE REDUCING FRINGE DATA TO USEFUL ENGINEERING DATA IS AN EXTREMELY LABORIOUS PROCESS. KMSF IS NOW DEVELOPING SOFTWARE THAT ADDRESS DIFFERENT ASPECTS OF THE TYPE OF FLEXIBLE RESEARCH TOOL THAT IS REQUIRED FOR AUTOMATING THE ANALYSIS OF FRINGE DATA. HOWEVER, THE CURRENT DEVELOPMENT STILL DOES NOT ADDRESS A KEY TECHNICAL ISSUE, NAMELY; PROVIDING THE ABILITY TO CAPTURE AND ANALYZE FRINGE DATA IN REAL TIME OR NEAR REAL-TIME. TO ADDRESS THIS ISSUE, KMSF PROPOSES

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TO DEVELOP A REAL-TIME FLOW VISUALIZATION SYSTEM WITH THE ABILITY TO EITHER a) MEASURE THE FLOW FIELD SURROUNDING AN AIRFOIL AT ONE INSTANT WITH HOLOGRAPHIC INTERFEROMETRY IN REAL-TIME AND PROCESS THE INTERFEROGRAM ON-LINE IN NEAR REAL-TIME OR b) MEASURE THE FLOW FIELD OVER A SEQUENCE OF TIMES IN REAL-TIME AND PROCESS THE INTERFEROGRAMS EFFICIENTLY OFF-LINE. DURING THE PHASE I EFFORT, KMSF WILL DEVELOP THE FUNCTIONAL DESIGN SPECIFICATION REQUIRED FOR IMPLEMENTING A REAL-TIME FLOW VISUALIZATION SYSTEM.

KOPIN CORP
695 MYLES STANDISH BLVD
TAUNTON, MA 02780
CONTRACT NUMBER:
JACK P SALERNO
TITLE:
FEASIBILITY OF DEVICE-GRADE InP HETEROEPITAXY ON Si
TOPIC# 45 OFFICE: RADC/XPX IDENT#: 28571

THE PROPOSED THREE-PHASE PROGRAM ADDRESSES THE NEED FOR LARGE-AREA LOW-COST InP SUBSTRATES FOR ELECTRONIC AND OPTOELECTRONIC DEVICES. IN PHASE I, WE PROPOSE TO INVESTIGATE THE FEASIBILITY OF FORMATION OF SUCH InP SUBSTRATES BY GROWING InP AND RELATED TERNARIES HETEROEPITAXIALLY ON Si. THE PROPOSED GROWTH PROCESS IS ORGANO-METALLIC CHEMICAL VAPOR DEPOSITION. TWO SPECIFIC INNOVATIONS WILL BE INVESTIGATED THAT MAY REDUCE THE DEFECT DENSITY OF THE RESULTANT FILMS TO LEVELS SUITABLE FOR ELECTRONIC AND OPTOELECTRONIC DEVICES. IF THESE TECHNIQUES ARE PROVEN FEASIBLE, RESEARCH IN PHASE II WILL BE CARRIED OUT TO DEVELOP THE PROCESS. THE ULTIMATE OBJECTIVE OF THIS WORK IS THE COMMERCIALIZATION OF NEW INTEGRATED CIRCUITS FABRICATED ON SUCH SUBSTRATES. THIS PRODUCT DEVELOPMENT WILL BE CARRIED OUT IN PHASE II.

KOR ELECTRONICS
5731 McFADDEN AVE
HUNTINGTON BEACH, CA 92649
CONTRACT NUMBER:
MARTIN C SPRINGFIELD
TITLE:
WIDE BAND ELECTRONICS
TOPIC# 196 OFFICE: BMO/MYSC IDENT#: 28611

SUBMITTED BY

A REQUIREMENT EXISTS FOR PROTECTING ICBM WEAPON SYSTEM VEHICLES FROM EMERGING RADAR DIRECTED THREATS DURING THE POST BOOST GLIDE, RE-ENTRY VEHICLE DEPLOYMENT, AND FINAL BALLISTIC FLIGHT STAGES. THE ELECTRONICS REQUIRED FOR PERFORMING SUCH A TASK FACE MANY CONFLICTING REQUIREMENTS INCLUDING WIDEBAND OPERATION, SEVERE OPERATING ENVIRONMENTS, MINIMUM SIZE, WEIGHT, AND POWER CONSUMPTION, AND HIGHLY RELIABLE OPERATION. THIS PROPOSAL DESCRIBES A HIGHLY SYSTEMATIC APPROACH TO DEVELOPING THE COMPONENTS AND SUBSYSTEMS NECESSARY TO CONSTRUCT EFFECTIVE ELECTRONIC COUNTER MEASURE SYSTEMS INCORPORATING DIGITAL RF MEMORIES. THE APPROACH RECOGNIZES THAT SYSTEM CONCEPT DEVELOPMENT MUST NOT BE DIVORCED FROM HARDWARE DEVELOPMENT IF THE REALIZABLE, MOST OPTIMUM, AND AFFORDABLE SYSTEM IS TO BE DERIVED. A MULTI-ELEMENT 2 PHASE PROGRAM IS DESCRIBED. DURING THE FIRST PHASE, BASELINE ECM SYSTEMS ARE ESTABLISHED AND ANALYZED TO DETERMINE OPERATIONAL PARAMETERS. FROM THESE PARAMETERS ARE DERIVED THE REQUIREMENTS FOR FOUR CATEGORIES OF HARDWARE NECESSARY TO DEVELOP THE SYSTEMS. THE FIRST PHASE CONCLUDES BY PRIORITIZING AND DEFINING VARIOUS DEVELOPMENT PROGRAMS APPROPRIATE TO A PHASE II EFFORT TO EITHER CONSTRUCT AND TEST OR ELSE DEMONSTRATE PROOF OF PRINCIPLE OF VARIOUS ITEMS WITHIN THE CATEGORIES.

KOR ELECTRONICS INC
5731 McFADDEN AVE
HUNTINGTON BEACH, CA 92649
CONTRACT NUMBER:
MARTIN C SPRINGFIELD
TITLE:
CHIRP WAVEFORM COMPATIBLE COHERENT C-BAND PULSED RADAR TRANSPONDE
TOPIC# 189 OFFICE: AFWL/PRC IDENT#: 27146

A REQUIREMENT EXISTS FOR A C BAND TRANSPONDER THAT IS COMPATIBLE WITH THE CHIRP WAVEFORM MODE OF THE WESTERN SPACE AND MISSILE CENTER GROUND BASED TRACKING RADAR NETWORK. SUCH A DEVICE MUST BE CAPABLE OF COHERENT REPLICATION OF LINEAR FM WAVEFORMS AS WELL AS OTHER COHERENT WAVEFORMS SUCH AS PULSED CW AND PHASE ENCODED. COHERENT OPERATION PERMITS SIGNIFICANT REDUCTION IN TRANSMITTER POWER. THIS PROPOSAL DESCRIBES AN APPROACH WHICH APPLIED DIGITAL RF MEMORY (DRFM) TECHNOLOGY TO THE PROBLEM. A DRFM BASED APPROACH WAS THE

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ADVANTAGE OF BEING COMPATIBLE WITH A WIDE VARIETY OF WAVEFORMS, IT CAN UTILIZE SMALLER AND LESS EXPENSIVE MICROWAVE REFERENCE SOURCES THAN OTHER APPROACHES, AND UNLIKE OTHER APPROACHES, THE MAJORITY OF THE DEVICE CAN BE FABRICATED IN MONOLITHIC CIRCUITS. A 2 PHASE PROGRAM IS PROPOSED. IN THE FIRST PHASE THE TRANSPONDER SYSTEM OPERATING REQUIREMENTS WILL BE DETERMINED. BASED ON THE DEFINED REQUIREMENTS THE PERFORMANCE OF POSSIBLE TRANSPONDER CONFIGURATIONS WILL BE ANALYZED AND MODELED TO DETERMINE THE OPTIMUM APPROACH TO MINIMIZE SIZE, COST, AND POWER CONSUMPTION. THE FIRST PHASE WILL CONCLUDE BY SPECIFYING IN APPROPRIATE DETAIL THE DESIGN OF THE COHERENT RADAR TRANSPONDER AND DEFINING A PHASE II DEVELOPMENT PROGRAM TO CONSTRUCT AND TEST A BRASSBOARD SYSTEM. THE PERSONNEL WHO WILL BE ENGAGED IN THE WORK ARE LEADERS IN DRFM TECHNOLOGY.

KSA TECHNOLOGY
5689 PLUM ORCHARD DR
COLUMBUS, OH 43213
CONTRACT NUMBER:
V R STEWART
TITLE:
VERTICLE/SHORT TAKEOFF AND LANDING (V/STOL) STABILITY AND CONTROL IN GROUND EFFECTS
TOPIC# 99 OFFICE: AFWAL/ASD IDENT#: 26926

IN HOVER THE JET STEAMS FROM A V/STOL AIRCRAFT IMPINGE ON THE GROUND AND SPREAD OUT FROM THE IMPINGEMENT POINT IN RADICALLY FLOWING WALL JETS WITH FOUNTAIN FLOWS BETWEEN THE JETS WHERE THE WALL JETS MEET. THE FOUNTAIN FLOWS TEND TO PRODUCE A LIFTING FORCE BUT THE WALL JET ENTRAINMENT CAUSES AN OPPOSING LIFT LOSS OF SUCKDOWN. AT FORWARD SPEED, AS IN STOL OPERATION, THE FORWARD FLOWING WALL JET IS OPPOSED BY THE FREE STREAM AND ROLLED BACK ONTO ITSELF TO FORM A GROUND VORTEX WHICH ALSO INDUCES FORCES AND MOMENTS ON THE AIRCRAFT. OUR UNDERSTANDING OF THESE FLOW FIELDS IS INCOMPLETE AND OUR ABILITY TO ESTIMATE THE FORCES AND MOMENTS INDUCED IS INADEQUATE. THIS PROPOSAL IS SUBMITTED TO DEFINE THE FLOW FIELDS INVOLVED TO THE EXTENT POSSIBLE FROM THE EXISTING DATA BASE AND TO RECOMMEND AN EXPERIMENTAL PROGRAM TO EXPAND THE DATA BASE AND DEVELOP METHODS FOR ESTIMATING THESE INDUCED STABILITY AND CONTROL PARAMETERS.

KSE INC
PO BOX 368
AMHERST, MA 01004
CONTRACT NUMBER:
DR J R KITTRELL
TITLE:
HIGH TEMPERATURE NOx CONTROL PROCESS
TOPIC# 62 OFFICE: AFESC/RDXP IDENT#: 23243

SUBMITTED BY

THE AIR FORCE HAS TWO MAJOR AREAS OF NEED FOR NITROGEN OXIDE (NOx) CONTROL HAVING EXHAUST TEMPERATURES SUBSTANTIALLY ABOVE TYPICAL UTILITY BOILER APPLICATIONS, INCINERATION AND STATIONARY JET ENGINE TEST CELLS. EXISTING PROCESSES FOR THE SELECTIVE CATALYTIC REDUCTION (SCR) OR NOx BY AMMONIA ARE GENERALLY LIMITED TO TEMPERATURES OF ABOUT 750 DEG F. FOR THE AIR FORCE APPLICATIONS THESE UTILITY SCR SYSTEMS ARE INEFFECTIVE. KSE, INC. HAS RECENTLY DEVELOPED A NEW SCR SYSTEM SPECIFICALLY FOR THESE HIGH TEMPERATURE APPLICATIONS. THE CATALYST OPERATES WITH PEAK PERFORMANCE AT TEMPERATURES OF AT LEAST 1100 DEG F. THE CATALYST IS HIGHLY ACTIVE AND SMALL AMOUNTS ARE REQUIRED. AMMONIA CONSUMPTION IS ABOUT TWO-THIRDS THAT OF CONVENTIONAL CATALYSTS. THE CATALYSTS CAN BE EMPLOYED DIRECTLY IN THE EXHAUST GAS OF STATIONARY JET ENGINES OR INCENERATORS. ELIMINATION OF HEAT EXCHANGE AND SMALL CATALYST VOLUMES RESULT IN SIMPLER OPERATION AND LOWER CAPITAL INVESTMENT. LOWER PRESSURE DROP AND LOWER AMMONIA CONSUMPTION REDUCE OPERATING COSTS. THE LARGE EXISTING EXPERIENCE BASE ON OTHER SCR APPLICATIONS SHOULD ALLOW RAPID SCALEUP AND COMMERCIALIZATION. THIS SCR SYSTEM WILL HAVE SUBSTANTIAL ADVANTAGES, PERMITTING COST-EFFECTIVE CONTROL OF EMISSIONS FROM MILITARY HIGH TEMPERATURE SOURCES.

KTECH CORP
901 PENNSYLVANIA NE
ALBUQUERQUE, NM 87110
CONTRACT NUMBER:
JAMES J SPATES
TITLE:
INTEGRAL BLAST PRESSURE AMPLIFIER
TOPIC# 185 OFFICE: AFWL IDENT#: 27139

AN INTEGRAL BLAST PRESSURE AMPLIFIER IS PROPOSED. AFTER FULL DEVELOPMENT, THE DEVICE WILL BE CAPABLE OF MAKING AIR BLAST MEASUREMENTS IN SEVERE ENVIRONMENTS. DESIGN GOALS INCLUDE SMALL SIZE, LESS THAN 10 CUBIC INCHES, HARDENED TO 100 kg AND 100 K psi, A BANDWIDTH OF 100 kHz AND SETABLE BRIDGE EXCITATION, GAIN, ZERO AND SINGLE STEP CALIBRATION. THIS DEVICE WILL PROVIDE EXPERIMENTERS WITH HIGHER QUALITY DATA, FREE FROM INHERENT AND SHOCK-INDUCED CABLE EFFECTS.

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KTECH CORP
901 PENNSYLVANIA AVE NE
ALBUQUERQUE, NM 87110
CONTRACT NUMBER:
DAVID A HYNDMAN
TITLE:
DEVELOPMENT OF FREE FIELD TIME-OF-ARRIVAL GAUGES FOR LOW OVERPRESSURES
TOPIC# 187 OFFICE: AFWL IDENT#: 27143

THE PROPOSED EFFORT WILL DEMONSTRATE THE FEASIBILITY OF USING THE PIEZOELECTRIC POLYMER POLYVINYLIDENE FLUORIDE (PVF[2]) AS A LOW OVERPRESSURE (1-30psi) TIME-OF-ARRIVAL (TOA) TRANSDUCER. A SERIES OF SHOCK TUBE CALIBRATION EXPERIMENTS WILL BE PERFORMED ON EXISTING PVF(2) STRESS GAUGES. TWO DIFFERENT PROTOTYPE TOA GAUGE CONFIGURATIONS WILL BE DEVELOPED. CIRCUITRY FOR INTEGRATION OF PVF(2) TRANSDUCERS TO EXISTING AFWL/CERF DATA ACQUISITION SYSTEMS WILL BE DESIGNED. A CONCEPT DEMONSTRATION WILL BE PERFORMED AS AN ADD-ON EXPERIMENT TO A SCHEDULED FIELD TEST. OPTIONS FOR LOW-COST PVF(2) TOA MATERIALS WILL BE EVALUATED.

L.N.K. CORP
6811 KENILWORTH AVE - STE 306
RIVERDALE, MD 20737
CONTRACT NUMBER:
DR THOMAS TSAO
TITLE:
A SPECIALIZED NEURAL NETWORK BASED ON LIE GROUP THEORY FOR EXTRACTING 3D MOTION AND 3D LAYOUT OF VISIBLE SURFACES
TOPIC# 79 OFFICE: AFWAL/ASD IDENT#: 26898

SIMILARITY DEFINED THROUGH ABSTRACTION AND GENERALIZATION IS DIFFERENT FROM SIMILARITY UNDER TRANSFORMATION GROUPS. IN THEIR EARLY WORK TITLE "HOW TO KNOW UNIVERSALS", McCULLOCH AND PITTS STUDIED NEURAL NETWORKS WHICH RECOGNIZED UNIVERSALS, I.E., FEATURES INVARIANT UNDER GEOMETRIC TRANSFORMATIONS. MUCH WORK HAS BEEN DONE

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IN RECENT YEARS ON NEURAL NETWORKS FOR ABSTRACTION AND GENERALIZATION BUT LITTLE ATTENTION HAS BEEN PAID TO INVARIANCE UNDER TRANSFORMATIONS, AS ASPECT WHICH IS IMPORTANT FOR DYNAMIC SCENE ANALYSIS. PITTS AND McCULLOCH EXPLORED THE MECHANISM OF PERFORMING TRANSOFRMATIONS FROM CERTAIN TRANSFORMATION GROUPS IN ORDER TO EXTRACT "UNIVERSALS". HOWEVER, THEY DID NOT USE THE CONCEPT OF "ORIMITIVE OPERATION". ALL THE TRANSFORMATIONS FROM THE GROUP ARE EQUALLY IMPLEMENTED, AND THE NUMBER OF GEOMETRIC TRANSFORMATIONS IS VERY LARGE. USING LIE GROUP AND LIE ALGEBRA THEORY, WE PROPOSE A NEURAL NETWORK WHICH IMPLEMENTS THE LIE TRANSFORMATION GROUP VIA A FEW PRIMITIVE OPERATIONS CALLED ATOMIC TRANSFORMATIONS (I.E., GENERATORS OF THE DISCRETIZED LIE GROUP) THUS AVOIDING THE INTRACTABILITY OF PITTS AND McCULLOCH'S NEURAL NETWORKS. DUE TO THE ONE-TO-ONE CORRESPONDENCE BETWEEN 3D RIGID MOTION AND THE INDUCED COHERENT IMAGE TRANSFORMATIONS, THIS NEURAL NETWORK IS CAPABLE OF PICKING UP 3D MOTION AND ED LOCATION PARAMETERS.

LASER FARE LTL INC
1 INDUSTRIAL DR SO/LAN-REX INDUSTRIAL PK
SMITHFIELD, RI 02917
CONTRACT NUMBER:
MARK D MELLO
TITLE:
LIQUID OPTICS FOR LASER HOLE DRILLING
TOPIC# 216 OFFICE: BMO/MYSC IDENT#: 28635

WE PROPOSE A NEW LASER MACHINING TECHNIQUE USING NONLINEAR SELF-FOCUSING MEDIA SUCH AS CARBON DISULFIDE AND NITROBENZENE. THE TECHNIQUE USES THE CATASTROPIC SELF-FOCUSING SOLUTIONS TO THE NON-LINEAR WAVE EQUATION TO PRODUCE INTENSE NON-DIFFRACTING OPTICAL FILAMENTS IDEALLY SUITED FOR PRODUCING SMALL HOLES. THE "LIQUID OPTICS" OFFERS SEVERAL ADVANTAGES OVER CONVENTIONAL OPTICAL FOCUSING: 1) CONSIDERABLY SMALLER HOLES (10-50 MICRONS IN DIAMETER), 2) ELIMINATION OF CONICAL HOLES, 3) A SELF-ADJUSTING OPTICAL SYSTEMS THAT EFFECTIVELY PLACES A LENSE INSIDE THE EVOLVING HOLE, 4) CONFINEMENT OF DRILLING FRAGMENTS, AND 4) LOW COST. WE PROPOSE TO DEMONSTRATE THIS METHOD AT Nd:YAG AND RUBY LASER WAVELENGTHS WITH A VARIETY OF METALS AND CERAMICS INCLUDING THE NEWLY DISCOVERED HIGH T(c) SUPERCONDUCTORS. IN ADDITION, A COMPLETE NUMERICAL MODEL INCLUDING NON-

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LINEAR BEAM PROPAGATION AS WELL AS HEAT AND MASS TRANSFER FROM THE HOLE AREA WILL BE UNDERTAKEN ON A CYBER SUPERCOMPUTER AT THE JVNC AT PRINCETON UNIVERSITY.

LASER POWER OPTICS
12777 HIGH BLUFF DR
SAN DIEGO, CA 92130
CONTRACT NUMBER:
DR DOUGLAS TANIMOTO
TITLE:
FAR INFRARED LASER COUNTERMEASURES (FIRLCM)
TOPIC# 90 OFFICE: AFWAL/ASD IDENT#: 26914

ADVANCES IN CO2 LASER AND SENSOR TECHNOLOGY HAVE LED TO A PROLIFERATION OF TACTICAL SYSTEMS OPERATING IN THE FAR INFRARED SPECTRAL REGION (8-12 MICRONS). SOME EXAMPLES ARE LASER RANGEFINDERS, DESIGNATORS, BEAMRIDERS, SEARCH TRACK SETS, COMMUNICATORS, RADAR AND PERHAPS HIGH ENERGY LASER WEAPONS. TO COUUNTER ENEMY USE OF SUCH SYSTEMS, JAMMING AND COLLECTING SYSTEMS WHICH EMPLOY LASERS OF MODEST POWER OPERATING WITHIN THE SPECTRAL PASS-BAND OF THE THREAT WOULD BE DESIRABLE. A MODULATABLE, WAVELENGTH AGILE, EXTREMELY COMPACT FOR INFRARED LASER OF MODEST AVERAGE OUTPUT POWERS COULD BE EXTREMELY ATTRACTIVE FOR INFRARED COUNTERMEASURES AND OPTINT COLLECTIONS APPLICATIONS. A PULSED DISCHARGE CO2 LASER EMPLOYING A UNIQUE ELECTRIC DISCHARGE GAIN GENERATOR CONFIGURATION PROMISES SIGNIFICANT IMPROVEMENTS IN EFFICIENCY, COMPACTNESS, AND RELIABILITY. THE PROPOSED PROGRAM WILL EXAMINE OPTIMUM RESONATOR CONFIGURATIONS FOR THIS UNCONVENTIONAL GAIN GENERATOR INCLUDING THE VIABILITY OF DIAMOND TURNED ASPERIC OPTICS. IN ADDITION, THE FEASIBILITY OF DESIGNING AND FABRICATING SHARP CUTOFF THIN FILM COATINGS, NARROWBAND SPIKE FILTERS, AND MAXIMUM REFLECTORS TO PREFERENTIALLY SELECT DESIRED OUTPUT LINES OF THE CO2 WILL BE EXPLORED. AN ATTRACTIVE FEATURE OF THIS UNCONVENTIONAL LASER CONFIGURATION IS THE POTENTIAL FOR EXTREME MINIATURIZATION WHICH COULD LEAD TO EXPENDABLE INFRARED DECOY APPLICATIONS.

LASER POWER OPTICS
12777 HIGH BLUFF DR
SAN DIEGO, CA 92130
CONTRACT NUMBER:
DR J EARL RUDISILL
TITLE:
DEVELOPMENT OF COATINGS FOR IMPROVED IR DETECTOR EFFICIENCY
TOPIC# 168 OFFICE: AFSTC IDENT#: 27109

SUBMITTED BY

THE PERFORMANCE OF LONG WAVELENGTH INFRARED DETECTORS COULD BE SIGNIFICANTLY ENHANCED IF IT WAS POSSIBLE TO DEPOSIT ANTI-RELECTIVE (AR) COATINGS DIRECTLY UPON THE SURFACE OF THESE DETECTORS. APPLICATION OF AR COATINGS COULD (1) GREATLY REDUCE REFLECTANCE LOSSES (30-35%) INCURRED AT THE UNCOATED SURFACE OF DETECTORS, (2) REDUCE CROSSTALK IN THE OPTICAL TRAIN, AND (3) INCREASE DETECTIVITY WHICH TRANSLATES INTO REDUCED WEIGHT AND PACKAGING PENALTIES. TO ACHIEVE THIS GOAL, THE DEVELOPMENT OF A DEPOSITION PROCESS FOR COATING IR DETECTORS OF THE PC, PV AND BACKSIDE ILLUMINATOR TYPES WILL BE INVESTIGATED THROUGH THE DESIGN AND DEPOSITION OF AR AND BANDPASS FILTER COATINGS. EVALUATION CRITERIAL WILL INCLUDE: SPECTRAL TRANSPARENCY, DEPOSITION DIFFICULTY, THERMAL AND INSTRINSIC STRESS PROPERTIES AND ENVIRONMENTAL DURABILITY. ANTICIPATED RESULTS AT THE COMPLETION OF PHASE I WILL BE THE DEVELOPMMENT OF SINGLE AND/OR DOUBLE LAYER AR COATING CONFIGURATIONS FOR IR DETECTORS.

LASER POWER OPTICS
12777 HIGH BLUFF DR
SAN DIEGO, CA 92130
CONTRACT NUMBER:
DR DOUGLAS TANIMOTO
TITLE:
DUAL WAVELENGTH LASER CUTTER
TOPIC# 216 OFFICE: BMO/MYSC IDENT#: 28634

THE ABILITY TO CUT VERY SMALL AND VERY PRECISE HOLES HAS BEEN DEVELOPED, TO SOME DEGREE, BY ANISIMOV, ET AL(1). THE TECHNIQUE USED WAS THE COMBINATION OF TWO OR MORE LASERS IN ORDER TO DRILL VERY CLEAN HOLES. THAT IS, HOLES THAT HAVE VIRTUALLY NO KERF AND MAINTAIN DIMENSIONALITY THROUGH THE THICKNESS OF THE MATERIAL. IN THE SAME VEIN, WHAT IS PROPOSED IN THIS PROJECT WILL BE THE USE OF A CONTINUOUS WAVE INFRARED CO(2) LASER IN ORDER TO HEAT THE AREA THAT IS TO BE DRILLED AND THE COMBINATION OF A 100 HZ VISIBLE DYE LASER TO REMOVE THE METAL FROM THE HOLE. THE CO(2) LASER TAKES AWAY THE RADIAL COMPONENT OF THERMAL DIFFUSION SO THAT THE VISIBLE LASER ENERGY IS NOT DISSIPATED IN THE RADIAL COMPONENT. ALL THE ENERGY OF THE PULSE LASER IS ABSORBED DIRECTLY IN THE AREA THAT IS TO BE DRILLED. BY USING THE PULSED TECHNIQUE, MATERIAL CAN BE REMOVED MORE

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RAPIDLY WITH EACH PULSE. THE PERIOD OF TIME FOR THE CO(2) LASER TO IRRADIATE THE SURFACE WILL VARY FROM MATERIAL TO MATERIAL INASMUCH AS THE THERMAL DIFFUSION OF MANY OF THE HIGH TEMPERATURE ALLOYS IS SUBSTANTIALLY LOWER THAN THOSE OF THE MORE CONVENTIONAL METALS. AT THE SAME TIME, ONE WOULD WANT TO DRILL THE HOLES WITHOUT DISTRESSING THE TEMPER OF THE SURROUNDING METAL. THE TEMPERATURE RISE CREATED BY THE THERMAL FIELD LASER MUST BE SET AT A LEVEL THAT WILL ENHANCE THE PULSED LASER EFFECTIVENESS AND NOT DISTURB THE CRYSTAL STRUCTURE OF THE SURROUNDING MATERIAL.

LASER-GENICS CORP
PO BOX 611330
SAN JOSE, CA 95161
CONTRACT NUMBER:
DR RICHARD SCHLECHT
TITLE:
VERY HIGH TEMPERATURE FIBERS OF TiC AND TiB(2)
TOPIC# 112 OFFICE: AFWAL/ASD IDENT#: 26945

COMPOSITE MATERIALS FOR COMPONENTS OF ADVANCED AEROSPACE POWER AND PROPULSION SYSTEMS OFFER PERFORMANCE, WEIGHT AND COST ADVANTAGES OVER COMPETING MATERIALS. INCREASING DEMANDS ON THE STRENGTH AND TEMPERATURE TOLERANCE FOR THESE MATERIALS WILL REQUIRE INNOVATIVE APPROACHES IN COMPOSITION AND FABRICATION. COMPOSITE MATERIALS COMPOSED OF SINGLE CRYSTAL WHISKERS SHOW PROMISING TENSILE STRENGTH BUT HAVE PROVEN DIFFICULT TO GROW AND HAVE NOT BEEN PRODUCED IN USEFUL LENGTHS. LASER-GENICS CORPORATION IS PROPOSING TO INVESTIGATE THE GROWTH OF SINGLE CRYSTAL FIBERS OF TiB(2) AND TiC BY THE LASER HEATED PEDESTAL GROWTH TECHNIQUE. TiB(2) HAS A MELTING POINT OF 2900 DEG C AND TiC HAS A MELTING POINT OF 3140 DEG C MAKING THEM VERY DIFFICULT TO GROW IN ANY CONFIGURATION. WE HAVE ACHIEVE INITIAL SUCCESS IN GROWING BOTH TiC AND TiB(2) BUT IN ORDER TO ACHIEVE COMMERCIALLY INTERESTING LENGTHS OF THESE MATERIALS, THE GROWTH MUST BE OPTIMIZED. FIBERS WILL BE GROWN, THEIR MORPHOLOGY CHARACTERIZED AND STRENGTH MEASUREMENTS MADE DURING THE PHASE I EFFORT. SINGLE CRYSTAL FIBERS OF MULTI-METER LENGTHS WILL BE THE BASIS OF PHASE II.

LASER-GENICS CORP
PO BOX 611330
SAN JOSE, CA 95161
CONTRACT NUMBER:
DR RICHARD SCHLECHT
TITLE:
SINGLE CRYSTAL FIBERS OF MgO:LiNbO(3)
TOPIC# 230 OFFICE: AFOSR/NP IDENT#: 28661

SUBMITTED BY

AS OPTICAL INSTRUMENTS BECOME MORE WIDELY USED IT BECOMES NECESSARY TO MAKE THESE INSTRUMENTS SMALLER AND MORE COMPACT, LIGHTER IN WEIGHT AND MORE EFFICIENT. THE MOST COMPACT TUNABLE SOLID STATE LASER SOURCE OF GOOD BEAM QUALITY WOULD BE A SEMICONDUCTOR LASER PUMPLED CRYSTAL FIBER LASER. TO DEVELOP A TUNABLE SINGLE CRYSTAL FIBER LASER THAT IS TUNABLE FROM 660nm TO BEYOND 1000nm IS THE SUBJECT OF OUR SBIR PROPOSAL. THE FIRST STEP IN THE DEVELOPMENT OF THIS SYSTEM REQUIRES THE DEVELOPMENT OF THE SECOND HARMONIC GENERATOR. THIS IS THE SUBJECT OF OUR PHASE I PROGRAM. WE PROPOSE TO DEVELOP SINGLE CRYSTAL FIBERS OF MgO:LiNbO(3) AS THE SHG CRYSTAL. THE ADVANTAGES OF SINGLE CRYSTAL FIBERS FOR THIS APPLICATION ARE THE LONG INTERACTION LENGTHS THAT RESULT, THE COMPACTNESS OF THE SYSTEM AND THE EASE WITH WHICH THE CRYSTAL CAN BE BOTH TEMPERATURE CONTROLLED AND TUNED. DURING THE COURSE OF THE PHASE II PROGRAM WE WILL DEVELOP SINGLE CRYSTAL FIBER LASERS OF Nd:YAG AND Ti;Al(2)O(3) THAT CAN BE TUNED CONTINUOUSLY BETWEEN 660nm AND OVER 1000nm. THE LASER SYSTEM WILL THEN BE COMPOSED OF A Nd:YAG FIBER LASER PUMPED BY A DIODE ARRAY; THE MgO:LiNbO(3) FIBER FREQUENCY DOUBLER; AND THE Ti:Al(2)O(3) FIBER TUNABLE LASER.

LNR COMMUNICATIONS INC
180 MARCUS BLVD
HAUPPAUGE, NY 11788
CONTRACT NUMBER:
J de GRUYL
TITLE:
60 GHz IMPATT DIODES
TOPIC# 157 OFFICE: AFSTC IDENT#: 28560

GALLIUM ARSENIDE (GaAs) IMPATT DIODES ARE THE PRIMARY CANDIDATES FOR USE AS THE ACTIVE ELEMENT IN 60 GHz SOLID STATE COMBINATORIAL (OR ACTIVE APERTURE) TRANSMIT POWER AMPLIFIERS FOR LONG RANGE WIDEBAND INTERSATELLITE COMMUNICATION LINKS. IN THIS APPLICATION A MULTIPLICITY OF IDENTICAL 60 GHz IMPATT DIODES (AND "BUILDING BLOCK" AMPLIFIER STAGES) ARE REQUIRED, EACH OF MAXIMUM ACHIEVABLE EHF OUTPUT POWER AND DC-EHF CONVERSION EFFICIENCY, IN ORDER TO MINIMIZE THE COMPLEXITY AND PRIMARY POWER CONSUMPTION AND ENHANCE THE RELIABILITY OF THE OVERALL TRANSMITTER. ACCORDINGLY, LNR PROPOSES A PHASE I

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STUDY PROGRAM TO INVESTIGATE AND PERFORM TRADEOFF ANALYSES ON ALTERNATIVE 60 GHz GaAs IMPATT DEVICE DESIGNS, WITH RESPECT TO SUCH ASPECTS AS EPITAXIAL GaAs DOPING PROFILE AND GROWTH TECHNIQUE, IMPATT DIODE CHIP AND PACKAGING GEOMETRY, AND EMBEDDING CONFIGURATION AND THEIR RESPECTIVE IMPACT ON RF PERFORMANCE. THE PROPOSED STUDY WILL CULMINATE IN A PRELIMINARY IMPATT DIODE PERFORMANCE SPECIFICATION AND A TASK DEFINITION FOR A PHASE II PROOF OF CONCEPT (POC) IMPATT DIODE AND AMPLIFIER IMPLEMENTATION EFFORT.

MAINSTREAM ENGINEERING CORP
268 N BABCOCK ST - STE C
MELBOURNE, FL 32935
CONTRACT NUMBER:
RONALD G BARILE
TITLE:
PRODUCTION OF SPACECRAFT-GRADE NITROGEN TETROXIDE (N[2]O[4])
TOPIC# 159 OFFICE: AFSD IDENT#: 27090

THIS PROJECT AIMS AT DEVELOPING A NEW MEANS OF PRODUCING NITROGEN TETROXIDE (N[2]O[4]) WITH SUITABLE PURITY FOR USE AS SPACECRAFT FUEL OXIDIZER. THE IMMEDIATE OBJECTIVE IS TO VALIDATE BENCH PRODUCTION OF NITROGEN TETROXIDE BY CATALYTIC COMBUSTION OF AMMONIA. THIS TECHNOLOGY HAS ALREADY BEEN DEMONSTRATED IN THE LABORATORY, AND IS PRACTICALLY IDENTIFIED TO THE FIRST TWO STEPS IN COMMERCIAL-SCALE PRODUCTION OF NITRIC ACID. AIR WITH 10% VOLUME AMMONIA IS PASSED OVER A CATALYST AT ABOUT 1000 DEG C, AT PRESSURES BETWEEN ATMOSPHERIC AND 100 psi. THE PRODUCT GAS IS SEPARATED FROM REACTANTS AND BY-PRODUCT WATER BY LIQUID ABSORPTION, AND THEN OXIDIZED AGAIN TO FORM A NO(2)-N(2)O(4) MIXTURE. (THIS MIXTURE IS THE FINAL PRODUCT, BUT IT MUST BE HANDLED WITH EXTREME CARE TO MAINTAIN CHEMICAL PURITY AND SAFETY STANDARDS.) A LAB-SCALE PROCESS WILL BE CONSTRUCTED AND PROCESS DATA WILL BE MEASURED, THUS DEFINING THE FLOW SHEET. A SIMULATION OF THE PROCESS WILL BE DONE TO DETERMINE THE MOST ECONOMICAL CHOICES IN OPERATING PARAMETERS. THE OPTIMIZATION WILL BE DONE ON A STATE-OF-THE-ART CHEMICAL PROCESS SIMULATOR (ELG., ASPEN, SSI, CHEMSHARE, ETC.).

MAINSTREAM ENGINEERING CORP
268 N BABCOCK ST - STE C
MELBOURNE, FL 32935
CONTRACT NUMBER:
LAWRENCE R GRZYLL
TITLE:
INVESTIGATION OF NOVEL WORKING FLUIDS FOR USE IN SPACECRAFT HEAT PIPES
TOPIC# 170 OFFICE: AFAL IDENT#: 27116

SUBMITTED BY

IN ORDER TO UTILIZE A WORKING FLUID FOR A SPECIFIC HEAT PIPE APPLICATION THE WORKING FLUID MUST HAVE A USEFUL TEMPERATURE RANGE THAT SPANS THE TEMPERATURE LIMITS OF THE HEAT PIPE. AN OVERVIEW OF THE STATUS OF CURRENT HEAT PIPE WORKING FLUIDS SHOWS THAT NONE OF THE CURRENT WORKING FLUIDS CAN BE USED OVER THE 450-700 K TEMPERATURE RANGE. BY PREDICTING THE LIQUID TRANSPORT FACTOR OF VARIOUS COMPOUNDS SEVERAL NOVEL WORKING FLUIDS WERE FOUND THAT CAN BE USED OVER THE 450-700 K TEMPERATURE RANGE. THE LIQUID TRANSPORT FACTOR HAS A PRONOUNCED EFFECT ON HEAT PIPE DESIGN. THE PROPOSED STUDY WILL EXPERIMENTALLY VERIFY THE PROPERTIES USED IN THE PREDICTION OF THE LIQUID TRANSPORT FACTOR OF THE NOVEL COMPOUNDS. THESE PROPERTIES ARE THE LIQUID DENSITY, LIQUID SURFACE TENSION, AND LIQUID VISCOSITY. IN ADDITION, THE THERMAL STABILITY AND CORROSIVE PROPERTIES OF THE NOVEL FLUIDS WILL BE DETERMINED. THIS WORK WILL DETERMINE THE FEASIBILITY OF USING THESE COMPOUNDS AS HEAT PIPE WORKING FLUIDS.

MARK RESOURCES INC
2665 - 30TH ST/STE 200
SANTA MONICA, CA 90405
CONTRACT NUMBER:
AUGUST W RIHACZEK
TITLE:
ALGORITHM FOR SLOW MOVING TARGETS
TOPIC# 160 OFFICE: AFSD IDENT#: 27094

THE GOAL OF THE PROPOSED PROGRAM IS TO DEVELOP AN ALGORITHM FOR THE DETECTION OF SLOW MOVING GROUND VEHICLES IN THE CLUTTER. ALTHOUGH THE APPLICATION IS INTENDED FOR THE DETECTION OF SLOW MOVING VEHICLES FROM A SPACEBORNE PLATFORM, THE ALGORITHM WILL ALSO HAVE A MUCH MORE GENERAL APPLICATION. IT WILL BE AN ALGORITHM FOR THE DETECTION OF MOVING TARGETS WHEN THE MOTION IS SO LOW THAT THE CLUTTER CANNOT BE SUPPRESSED BY DOPPLER FILTERING, AS IS DONE IN MTI SYSTEMS. THE PROPOSED APPROACH IS BASED ON A NEW SIGNAL PROCESSING TECHNOLOGY WHICH HAS BEEN UNDER DEVELOPMENT FOR THE PAST SEVERAL YEARS AT MARK RESOURCES. THIS SIGNAL PROCESSING TECHNOLOGY IS AN EXTENSION AND ADAPTATION OF CONVENTIONAL RANGE/DOPPLER PROCESSING TO THE PECULIAR BACKSCATTERING PROPERTIES OF MANMADE TARGETS. ALTHOUGH IT HAS BEEN DEVELOPED PRIMARILY FOR TARGET IDENTIFICATION RATHER THAN DETECTION,

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IT CAN ALSO BE UTILIZED FOR TARGET DETECTION IN A CLUTTER BACKGROUND, BECAUSE THE PROBLEM CAN BE REDUCED TO ONE OF DISCRIMINATING TREES FROM TARGETS.

MARKO MATERIALS INC
144 RANGEWAY RD
NORTH BILLERICA, MA 01862
CONTRACT NUMBER:
DR C J YANG
TITLE:
THIN FILM PERMANENT MAGNETS
TOPIC# 43 OFFICE: RADC/XPX IDENT#: 28569

THIN FILM TYPE PERMANENT MAGNET MAY OFFER AN ATTRACTIVE ALTERNATIVE TO BULK MAGNETS FOR BIASING VARIOUS MICROWAVE DEVICES IN RADAR AND COMMUNICATION DEVICES. SPUTTERING HAS BEEN USED TO FABRICATE THIN FILMS (1-3 MICRONS) OF PERMANENT MAGNETS BASED ON Sm-Co AND Fe-Nd-B ALLOYS HAVING HIGH ENERGY PRODUCTS AND HIGH COERCIVITIES, HOWEVER, FOR MSW DEVICES, SUFFICIENTLY THICK (100-150 MICRONS) PERMANENT MAGNET FILMS ARE NEEDED. THE PROPOSED PHASE I RESEARCH IS DIRECTED AT DEMONSTRATING A PRACTICAL, CONTROLLABLE METHOD OF FABRICATING HIGH QULITY THICK PERMANENT MAGNET FILMS. AN INNOVATIVE INTERFACE ENGINEERING APPROACH WILL BE ADOPTED TO BUILD A MULTILAYERED SPUTTER-DEPOSITED FILM OF SUFFICIENT THICKNESS WHICH WILL ADHERE STRONGLY TO THE SUBSTRATE. THE GOAL IS TO PRODUCE PERMANENT MAGNET FILMS THAT EXHIBIT HIGH INTRINSIC COERCIVITIES AND LARGE REMANENT MOMENTS WITH STRONG MAGNETIC ANISOTROPIES.

MARTINGALE RESEARCH CORP
100 ALLENTOWN PKWY - STE 211
ALLEN, TX 75002
CONTRACT NUMBER:
DR ROBERT L DAWES
TITLE:
DEVELOPMENT OF A NEURAL NETWORK KALMAN FILTER FOR DYNAMIC IMAGE UNDERSTANDING
TOPIC# 85 OFFICE: AFWAL/ASD IDENT#: 26908

SUBMITTED BY

THE PROPOSED RESEARCH BUILDS UPON THE CONTRACTOR'S PROPRIETARY NEURAL NETWORK SPACE-TIME MEMORY, THE PARAMETRIC AVALANCHE, TO DETERMINE A SET OF DESIGN CHARACTERISTICS FOR NEUROCOMPUTING ARCHITECTURES THAT WILL EFFECTIVELY SUPPORT REAL TIME UNDERSTANDING OF DYNAMIC IMAGERY. THE APPROACH TO THIS PROBLEM IS TO USE THE PARAMETRIC AVALANCHE TO IMPLEMENT A KALMAN FILTER WHICH IS CAPABLE OF TRACKING AND PREDICTING THE EVOLUTION OF LARGE NUMBERS OF OBSERVABLE OBJECTS WITH WIDELY DIFFERING DYNAMICS, AND IS ALSO CAPABLE OF LEARNING TO PREDICT NOVEL SPACE-TIME PATTERNS.

MATERIAL & ELECTROCHEMICAL RSCH (MER) CO
4233 S FREMONT AVE
TUCSON, AZ 85714
CONTRACT NUMBER:
J C WITHERS
TITLE:
EROSION RESISTANT CERAMIC COMPOSITE CONDUCTIVE RAIL
TOPIC# 4 OFFICE: AD/PMR IDENT#: 23334

HYPERVELOCITY LAUNCHER SYSTEMS PLACE SEVERE DEMANDS ON BOTH THE INSULATOR AND CONDUCTIVE RAILS. RECENTLY A WHISKER REINFORCED ALUMINA INSULATOR RAIL SHOWED SUPERIOR EROSION PERFORMANCE IN RAIL GUN TEST, HOWEVER, THE CONDUCTIVE COPPER RAILS ERODED SEVERELY AS WELL AS CREATE AN ANTICIPATED EXPANSION PROBLEM IN FULL SCALE SYSTEMS. IT IS ANTICIPATED A CONDUCTIVE CERAMIC, TiB(2), COMPOSITE CAN PERFORM SIMILARLY TO THE INSULATOR RAIL WHICH WOULD RESULT IN A LOW EXPANSION COMPOSITE CONDUCTIVE RAIL WITH NO EROSION. THE TiB(2) COMPOSITE WILL BE OPTIMIZED WITHOUT AND WITH A CONDUCTIVE NIOBIUM METAL LAYER. THE OPTIMIZED COMPOSITES WILL BE FABRICATED INTO CONDUCTIVE RAILS FOR TEST AT EGLIN AFB A15 TEST SITE FOLLOWED BY A POST MORTUM ANALYSIS OF THE COMPOSITE AFTER TESTING. A LOW EXPANSION EROSION RESISTANT CONDUCTIVE AND INSULATOR RAIL WILL RESULT IN A SYSTEM THAT CAN BE MULTIPLE FIRED.

MAXDEM INC
267 S FAIR OAKS AVE
PASADENA, CA 91105
CONTRACT NUMBER:
DR NEIL HENDRICKS
TITLE:
NONLINEAR OPTICAL PROPERTIES OF POLYQUINOLINES
TOPIC# 182 OFFICE: AFWL/PRC IDENT#: 27133

SUBMITTED BY

SEVERAL POLYQUINOLINES WILL BE PREPARED AND THEIR NONLINEAR SUSCEPTIBIITIES MEASURED. THESE POLYMERS OFFER A UNIQUE COMBINATION OF SYNTHETIC VERSATILITY AND ELECTRONIC PROPERTIES.

MAYFLOWER COMMUNICATIONS CO INC
384 LOWELL ST - STE 106
WAKEFIELD, MA 01880
CONTRACT NUMBER:
TRIVENI N UPADHYAY
TITLE:
THE GPS AND INERTIALLY INSTRUMENTED SATELLITE FOR GLOBAL GRAVITY FIELD MAPPING
TOPIC# 175 OFFICE: AFGL/XOP IDENT#: 27121

THE PROPOSAL ADDRESSES ENHANCEMENT TECHNIQUES TO GPS/INERTIAL TRACKING OF A LOW EARTH ORBIT (LEO) SATELLITE FOR GLOBAL GRAVITY FIELD MAPPING. IT POINTS OUT THAT THE PROBLEM OF GPS/INERTIAL TRACKING OF LEO SATELLITE FOR GRAVITY MAPPING ENCOMPASSES THE PROBLEM OF INTER-SATELLITE STATE VECTOR DETERMINATION AND THE PROBLEM OF SATELLITE ORIENTATION DETERMINATION. THE AFGL STS-GPS TRACKING EXPERIMENT REQUIREMENTS ARE USED AS AN EXAMPLE TO DEMONSTRATE HOW THE ENHANCED GPS/INERTIAL TRACKING TECHNIQUE CAN BE USED TO IMPROVE THE MEASUREMENT AND DATA PROCESSING ACCURACY OF THE GLOBAL GRAVITY FIELD MAPPING. METHODS TO IMPROVE THE ACCURACY OF THE MEASUREMENTS ARE PROPOSED WHICH WILL BE ANALYZED IN PHASE I TO PROVE THE FEASI-BILITY OF THE OVERALL CONCEPT.

MDA ENGINEERING INC
PO BOX 120552
ARLINGTON, TX 76013
CONTRACT NUMBER:
DR STEVE KENNON
TITLE:
A NEW LOOK AT FINITE-VOLUME METHODS
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23276

APPLICATION OF NUMERICAL METHODS TO SOLVE FOR THE FLOWFIELD OVER

SUBMITTED BY

COMPLEX CONFIGURATIONS DEPENDS HEAVILY ON THEIR SUITABILITY FOR ARBITRARY MESH SHAPES. MAJOR DIFFICULTIES APPARENT WITH PRESENT FINITE VOLUME SCHEMES INCLUDE UNCERTAINTY IN DEFINING FUNCTIONAL POINT EVALUATIONS, ORDER OF APPROXIMATIONS AND ADHOC SCHEMES TO INCORPORATE PAPER PHYSICS. THIS RESEARCH IS TARGETED AT APPLYING FUNCTIONAL APPROXIMATIONS FOR CONSERVED QUANTITIES IN FINITE-VOLUME METHODS THUS ELIMINATING THE UNCERTAINTY OF POINT EVALUATION. THE METHOD PROPSED UTILIZES THE IDEA OF BASIS FUNCTIONS AND NATURALLY LEADS TO IMPLICIT SOLVERS FOR THE CONSERVED QUANTITIES. THE CONCEPT OF UPWINDING IS INCORPORATED THROUGH APPROPRIATE ALTERATIONS OF ASSUMED FUNCTIONAL APPROXIMATIONS FOR THE DEPENDENT VARIABLES.

MEGA RESEARCH INC
29711 WHITLEY COLLINS DR
RANCHO PALOS VERD, CA 90274
CONTRACT NUMBER:
ERH-RONG WU
TITLE:
IMPROVED ANALYTICAL CAPABILITIES FOR FOIL AIR BEARINGS
TOPIC# 137 OFFICE: AFWAL/ASD IDENT#: 26982

THIS PROPOSAL IS CONCERNING WITH THE DEVELOPMENT OF ANALYTICAL METHODS FOR COMPLIANT FOIL AIR BEARING PERFORMANCE PREDICTIONS, BEARING COEFFICIENTS CALCULATIONS AND ROTOR-BEARING SYSTEM ANALYSIS. THE ANALYSIS WILL TAKE INTO ACCOUNT THE THERMOHYDRODYNAMICS OF THE FLUID FILM AND THE THERMOELASTICITY OF THE COMBINED TOP AND BOTTOM FOILS. BOTH THRUST AND JOURNAL BEARING MODELS ASSIMILATING POPULAR FOIL BEARINGS WILL BE CONSIDERED. FOR THE FLUID FILM, A NAVIER-STOKES APPROACH IN CONJUNCTION WITH THE TWO EQUATION, K-E, TURBULENCE MODEL AND THE CONTROL VOLUME METHOD, WILL BE ADOPTED TO FORMULATE AND DISCRETIZE THE DIFFERENTIAL EQUATIONS. FOR THE FOILS, THE FORMULATION OF EQUATIONS WILL BE BASED ON A THIN PLATE MODEL WITH THE THERMAL EFFECT. COMPUTER CODES ARE TO BE DEVELOPED TO IMPLEMENT THE NUMERICAL SOLUTIONS FOR THE TWO REGIONS. BEARING PERFORMANCE CHARACTERISTICS SUCH AS LOAD CAPACITY, POWER LOSSES, FLOW RATES AND TEMPERATURE FIELDS WILL BE COMPUTED. THE BEARING COEFFICIENTS, STIFFNESS AND DAMPING, WILL BE COMPUTED. THE BEARING COEFFICIENTS WILL BE LINKED TO A ROTOR DYNAMICS CODE, RSVP (ROTOR-STRUCTURE-VIBRATION-PROGRAM) FOR THE ROTOR-BEARING SYSTEM ANALYSIS.

SUBMITTED BY

MERIDIAN CORP
4300 KING ST - STE 400
ALEXANDRIA, VA 22302
CONTRACT NUMBER:
MARK D BRYFOGLE
TITLE:
FORCE REFLECTION AND TACTILE FEEDBACK TECHNOLOGY
TOPIC# 73 OFFICE: AAMRL/HSD IDENT#: 26888

THIS RESEARCH INVESTIGATES BILATERAL TELEOPERATION OF A SIX DOF MANIPULATOR WITH A SEVEN DOF EXOSKELETON. THE EMPHASIS OF THIS RESEARCH IS PLACED ON THE CONTROL OF REDUNDANT FREEDOMS AND FORCE FEEDBACK FIDELITY. A DEVELOPMENT OF EXOSKELETONS AND FORCE FEEDBACK IS PRESENTED IN THIS PROPOSAL. VARIOUS CONTROL TECHNIQUES WITH COMPARATIVE FIGURES OF MERIT ARE ALSO PRESENTED. THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO DEVELOP ADVANCED ALGORITHMS FOR THE CONTROL OF BILATERAL EXOSKELETONS.

MICROWAVE MONOLITHIC INC
465 E EASY ST - UNIT 'F'
SIMI VALLEY, CA 93065
CONTRACT NUMBER:
WENDELL C PETERSEN
TITLE:
WIDEBAND MONOLITHIC GaAs COMPONENTS FOR RE-ENTRY VEHICLE APPLICATIONS
TOPIC# 196 OFFICE: BMO/MYSC IDENT#: 28610

MICROWAVE MONOLITHICS INCORPORATED (MMInc>), WITH TEXTRON DEFENSE SYSTEMS ADVANCED TECHNOLOGY CENTER (TEXTRON) AS SUBCONTRACTOR, PROPOSES A SIX MONTH PHASE I PROGRAM TO IDENTIFY AND BEGIN DEVELOPMENT OF THOSE KEY WIDEBAND GaAs MONOLITHIC MICROWAVE INTEGRATED CIRCUIT (MMIC) COMPONENTS WHICH WOULD HAVE MAXIMUM IMPACT ON RE-ENTRY VEHICLE (RV) PENETRATION AID PERFORMANCE, SIZE, WEIGHT, AND EFFICIENCY. MONOLITHIC POWER AMPLIFIERS IN THE TWO WATT RANGE COVERING 2 TO 12 GHz, AND POSSIBLE BEYOND, COULD LEAD TO SYSTEMS COVERING MULTIPLE

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THREAT RADARS, THEREBY GREATLY INCREASING PROBABILITY OF PENETRATION. THEREFORE THIS AMPLIFIER, BASED ON MMInc.'S HIGH PERFORMANCE FULLY ION IMPLANTED GaAs POWER FET TECHNOLOGY, WILL BE A PRIMARY GOAL OF THE PROPOSED PROGRAM. OTHER WIDEBAND COMPONENTS, SUCH AS PHASE SHIFTERS, NOISE SOURCES, AND FREQUENCY DISCRIMINATORS WILL BE EVALUATED FOR SYSTEMS IMPACT AND MAY ALSO BE SELECTED FOR INITIAL DEVELOPMENT. FOLLOWING PRELIMINARY DESIGN AND EVALUATION OF THE SYSTEMS IMPACT IN PROGRAM PHASE I, THE SELECTED MMIC COMPONENTS WILL BE FABRICATED, CHARACTERIZED, AND OPTIMIZED IN PROGRAM PHASE II. FULL SYSTEMS DEVELOPMENT WOULD THEN OCCUR IN PROGRAM PHASE III, POSSIBLY WITH TEXTRON AS THE PRIME CONTRACTOR.

MICROWAVE MONOLITHICS INC
465 E EASY ST - UNIT F
SIMI VALLEY, CA 93065
CONTRACT NUMBER:
WENDELL C PETERSEN
TITLE:
MONOLITHIC GaAs LOW PHASE NOISE FREQUENCY SOURCES FOR MILSTAR AND ADVANCED DSCS APPLICATIONS
TOPIC# 167 OFFICE: AFSTC IDENT#: 27108

DEVELOPMENT OF AN ADVANCED K-BAND MONOLITHIC GaAs LOW PHASE NOISE FREQUENCY SOURCE BASED ON RECENT BREAKTHROUGHS IN DEVICE AND MMIC TECHNOLOGY IS PROPOSED BY MICROWAVE MONOLITHICS INCORPORATED THROUGH THE IMPLEMENTATION OF A 20 GHz MONOLITHIC PHASE LOCKABLE FREQUENCY SOURCE. SMALLER SIZE, INCREASED RELIABILITY, AND ENHANCED PERFORMANCE FOR APPLICATIONS SUCH AS MILSTAR AND ADVANCED DSCS WILL BECOME FEASIBLE AFTER DEVELOPMENT OF THIS KEY COMPONENT, WHICH IS FULLY COMPATIBLE WITH GaAs MONOLITHIC MICROWAVE AND MILLIMETER-WAVE INTEGRATED CIRCUIT TECHNOLOGY. A PROPRIETARY LOW 1/f NOISE THREE TERMINAL ACTIVE DEVICE COMPATIBLE WITH MONOLITHIC INTEGRATION ON GaAs SUBSTRATES, IN CONJUNCTION WITH ADVANCED OSCILLATOR CIRCUIT DESIGNS, MAKE THIS TECHNICAL OBJECTIVE POSSIBLE. IMPROVEMENT IN PHASE NOISE OF BETTER THAN 10 dB BELOW PRESENT GaAs MESFET COMPONENTS, AND HIGHER EFFICIENCY THAN GUNN DIODE AND FREQUENCY-MULTIPLE Si BIPOLAR TRANSISTOR COMPONENTS, ARE EXPECTED. FEASIBILITY OF THE PROPOSED MONOLITHIC CIRCUIT WILL BE DEMONSTRATED IN PROGRAM PHASE I BY CUSTOMIZATION OF THE DESIGN OF MMINC.'S EXISTING X-BAND DEVICE FOR

SUBMITTED BY

K-BAND OPERATION AND DETAILED DESIGN/ANALYSIS OF THE MONOLITHIC FREQUENCY SOURCE, FOLLOWED BY IMPLEMENTATION AND EVALUATION OF THIS COMPONENT IN PROGRAM PHASE II.

MICROWAVE MONOLITHICS INC
465 E EASY ST - UNIT 'F'
SIMI VALLEY, CA 93065
CONTRACT NUMBER:
DANIEL R CH'EN
TITLE:
MINIATURE HIGH EFFICIENCY 40 WATT MONOLITHIC GaAs POWER MODULE
TOPIC# 194 OFFICE: BMO/MYSC IDENT#: 28607

A THREE PHASE PROGRAM IS PROPOSED BY MICROWAVE MONOLITHICS INCORPORATED (MMInc.), WITH TEXTRON DEFENSE SYSTEMS ADVANCED TECHNOLOGY CENTER (TEXTRON) AS SUBCONTRACTOR, TO DEVELOP A MINIATURE 40 WATT (20 WATT PER POLARIZATION) HIGH EFFICIENCY C-BAND GaAs MMIC BASED POWER AMPLIFIER FOR RE-ENTRY VEHICLE APPLICATIONS. IN PROGRAM PHASE I, EXISTING PROPRIETARY HIGH EFFICIENCY MMIC COMPATIBLE GaAs FETs WILL BE CHARACTERIZED FOR THE UNIQUE REQUIREMENTS OF RE-ENTRY VEHICLE SYSTEMS AND, BASED ON THESE RESULTS AND AN EVALUATION OF DECOY, JAMMING, AND MASKING SYSTEMS REQUIREMENTS, A DETAILED DEVELOPMENT PLAN WILL BE GENERATED FOR THE DESIGN AND IMPLEMENTATION OF THESE AMPLIFIERS. PRELIMINARY DESIGN OF THE INITIAL CIRCUITRY IDENTIFIED IN THIS PLAN, COMPLETE WITH PERFORMANCE ESTIMATES, WILL CONCLUDE PROGRAM PHASE I. FABRICATION, CHARACTERIZATION, OPTIMIZATION, RELIABILITY TESTING, AND PACKAGING IN PREPARATION OF A FLYABLE MODEL WILL THEN FOLLOW IN PHASE II AND III. THE HIGH EFFICIENCY AND LOW STANDBY POWER OF THESE AMPLIFIERS WILL BE CRUCIAL TO THE SUCCESS OF NEXT GENERATION RE-ENTRY VEHICLES. DEPENDING ON THE SCOPY OF PROGRAM PHASE III, TEXTRON COULD EVOLVE INTO THE PRIME CONTRACTOR POSITION AS SYSTEMS IMPLEMENTATION BASED ON THE PROPOSED WIDEBAND MMICs BECOME THE MAJOR PROGRAM ACTIVITY.

MILLITECH CORP
PO BOX 109 - S DEERFIELD RESEARCH PK
SOUTH DEERFIELD, MA 01373
CONTRACT NUMBER:
G RICHARD HUGUENIN
TITLE:
NOVEL MILLIMETER WAVE SOURCES FOR PHASED ARRAY APPLICATIONS
TOPIC# 156 OFFICE: AFSTC IDENT#: 27087

SUBMITTED BY

TWO OF THE MAJOR PROBLEMS IN MILLIMETER WAVE PHASED ARRAYS ARE: OVERCOMING THE SPACE LIMITATIONS FOR THE RADIATING MODULES BY INNOVATIVE APERTURE UTILIZATION TECHNIQUES AND PROVIDING A PRACTICAL BEAM SCANNING ARRANGEMENT. BOTH OF THESE IMPORTANT AREAS WILL BE INVESTIGATED BY COMPUTER ANALYSIS AND LIMITED BREADBOARD TESTING IN ORDER TO DEFINE SPECIFIC TASKS AND SPECIFICATIONS FOR A PRACTICAL MILLIMETER WAVE PHASED ARRAY.

MINOTAUR TECHNOLOGIES
300 MONTGOMERY
ANN ARBOR, MI 48105
CONTRACT NUMBER:
LEIF R SIMONSEN
TITLE:
SECONDARY BATTERIES BASED ON LOW TEMPERATURE MOLTEN SALTS
TOPIC# 121 OFFICE: AFWAL/ASD IDENT#: 26960

THE OBJECTIVE IS TO DEVELOP A SURVIVABLE, LIGHTWEIGHT HIGH ENERGY DENSITY ELECTROCHEMICAL ENERGY STORAGE DEVICE FOR SPACE APPLICATIONS. A NEW CLASS OF ELECTROLYTES, LOW TEMPERATURE MOLTEN SALTS (AND MODIFICATIONS THEREOF), OFFER THE OPPORTUNITY OF UTILIZING HIGH ENERGY DENSITY POSITIVE AND NEGATIVE ELECTRODES IN PREVIOUSLY UNTRIED COMBINATIONS. THE USE OF THESE LOW TEMPERATURE SYSTEMS OBVIATES SOME OF THE MATERIALS COMPATIBILITY PROBLEMS ASSOCIATED WITH HIGHER ENERGETIC, LOW TEMPERATURE SYSTEMS.

MISSION RESEARCH CORP
PO DRAWER 719
SANTA BARBARA, CA 93102
CONTRACT NUMBER:
DR STEVE F STONE
TITLE:
DAMAGE DETECTION AND ACTIVE CONTROL SYSTEMS FOR SMART AEROSPACE STRUCTURES
TOPIC# 93 OFFICE: AFWAL/ASD IDENT#: 26919

MISSION RESEARCH CORPORATION (MRC) PROPOSES AN SBIR PHASE I EFFORT

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THAT WILL INITIATE THE DEVELOPMENT OF INNOVATIVE TECHNIQUES FOR SENSING DAMAGE IN COMPOSITE STRUCTURES. THESE TECHNIQUES WILL INCLUDE CONVENTIONAL PIEZIORESISTIVE (STRAIN GAGE) AND FIBER OPTIC STRAIN MEASUREMENT. BROKEN GRAPHITE FIBERS WILL BE DETECTED BY CONDUCTING ELECTRIC CURRENT THROUGH THEM. AN OPEN CIRCUIT WILL INDICATE A DISCONTINUOUS FIBER. MRC WILL ALSO INVESTIGATE OTHER METHODS OF STRAIN AND PROPERTIES MEASUREMENT. ONCE PRELIMINARY INSTRUMENTATION IS CHOSEN, GRAPHITE EPOXY TENSILE BARS WILL BE MADE, EACH USING A DIFFERENT TECHNIQUE. TENSILE BARS WILL BE MADE FOR EACH METHOD UNTIL IT IS EITHER PERFECTED OR REJECTED. ONCE SENSING TECHNIQUES HAVE BEEN SELECTED, THEY WILL BE INCORPORATED INTO A GRAPHITE EPOXY PANEL. A COMPUTER PROGRAM WILL BE DEVELOPED, FOR THE MRC DATA ACQUISITION SYSTEM, TO RUN THE SMART PANEL. ONCE THE PANEL AND PROGRAM ARE DEBUGGED, A FINAL DEMONSTRATION PANEL WILL BE FABRICATED. PHASE II OF THE STUDY WILL BE TO USE FEEDBACK FROM SENSORS FOR ACTIVE MANIPULATION OF A STRUCTURE USING ACTUATORS.

MISSION RESEARCH CORP
1720 RANDOLPH RD SE
ALBUQUERQUE, NM 87106
CONTRACT NUMBER:
GEORGE Z HUTCHESON
TITLE:
AIRBORNE/SPACEBORNE PULSED-POWER SOURCE
TOPIC# 123 OFFICE: AFWAL/ASD IDENT#: 26963

MISSION RESEARCH CORPORATION (MRC) PROPOSES TO PERFORM AN ANALYTICAL AND COMPUTATIONAL INVESTIGATION OF THE DESIGN FEASIBILITY OF A COMPACT, LIGHTWEIGHT, REPETITIVELY PULSED, FAST RISETIME PULSED-POWER SOURCE. THIS SOURCE WILL BE CAPABLE OF PRODUCING PULSES OF HUNDREDS OF KILOVOLTS FOR HUNDREDS OF NANOSECONDS WITH RISETIMES ON THE ORDER OF A NANOSECOND OR LESS. ADDITIONALLY, THE DESIGN WILL INCORPORATE THE PULSER IN A VOLUME OF LESS THAN 46 FT(3) (1,300,000 cm[3]) AND A WEIGHT OF LESS THAN 600 LBS (272 kg).

MOLECULAR TECHNOLOGIES INC
145 MOORE ST
LOWELL, MA 01852
CONTRACT NUMBER:
DR JAYANT KUMAR
TITLE:
DESIGN OF SPATIAL LIGHT MODULATORS BASED ON HIGH TEMPERATURE SUPERCONDUCTORS
TOPIC# 11 OFFICE: AD/PMR IDENT#: 23371

SUBMITTED BY

A SPATIAL LIGHT MODULATOR SENSITIVE IN THE INFRARED AND AT SAME TIME PROVIDING THE CAPABILITY OF MODULATING A LASER BEAM IN THE VISIBLE SHALL BE OF GREAT VALUE IN OPTICAL INFORMATION PROCESSING. THIS PROPOSAL DISCUSSES THE FEASIBILITY OF SUCH A DEVICE UTILIZING HIGH TRANSITION TEMPERATURE SUPERCONDUCTORS IN CONJUNCTION WITH A NON-LINEAR OPTICAL MATERIAL. THE NONLINEARITY EXPLOITED FOR THESE DE-VICES ARE FARADAY ROTATION AND THE COTTON-MOUTON EFFECT. THESE OPTICAL NONLINEARITIES ARE INDUCED BY A MAGNETIC FIELD. PHASE I OBJECTIVES INCLUDES THE DEVELOPMENT OF A MODEL FOR THE PROPOSED DEVICE, EXPERIMENTS TO TEST THE VALIDITY OF THE DEVICE PRINCIPLES, SURVEY AND IDENTIFICATION OF MATERIALS FOR BEST DEVICE PERFORMNCE AND PROPOSAL OF DEVICE CONFIGURATIONS. THE RESULTS OF PHASE I WILL PROVIDE THE FOUNDATION FOR PHASE II WORK.

MOLECULAR TECHNOLOGIES INC
145 MOORE ST
LOWELL, MA 01852
CONTRACT NUMBER:
DR JAVANT KUMAR
TITLE:
OPTICAL SWITCHING AND OPTICAL DATA PROCESSING APPLICATIONS OF HIGH TEMPERATURE SUPERCONDUCTORS
TOPIC# 76 OFFICE: AFWAL/ASD IDENT#: 26893

SUPERCONDUCTING ELECTRONICS HAS BEEN EXPLORED IN THE PAST FOR APPLICATIONS SUCH AS LOGIC ELEMENTS, MICROWAVE DETECTORS AND SOURCES. HOWEVER, VERY LITTLE WORK IF ANY HAS BEEN REPORTED ON APPLICATION OF SUPERCONDUCTIVITY FOR FABRICATION OF INFRARED DETECTORS, INFRARED SPATIAL LIGHT MODULATORS AND INFRARED TO VISIBLE WAVELENGTH SHIFTERS. A NOVEL TECHNIQUE WHICH COMBINES SUPERCONDUCTIVITY AND NONLINEAR OPTICS IS PROPOSED TO IMPLEMENT INFRARED SPATIAL LIGHT MODULATORS AND OPTICAL SWITCHES. THE NONLINEAR OPTICAL PROPERTIES TO BE EXPLOITED FOR THESE DEVICES ARE THE FARADAY ROTATION AND THE COTTON-MOUTON EFFECT. THESE EFFECTS ARE INDUCED BY APPLICATION OF MAGNETIC FIELDS. IN ADDITION, THE POSSIBILITY OF USING HIGH TEMPERATURE SUPERCONDUCTORS AS FAR INFRARED SOURCES AND DETECTORS WILL BE INVESTI-GATED. PHASE I TECHNICAL OBJECTIVES WILL DEVELOP THE PHYSICAL PRINCIPLES AND A MODEL FOR THE DEVICES, EXPERIMENTALLY TEST THE

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VALIDITY OF THE CONCEPTS AND IDENTIFY THE PROMISING MATERIALS FOR DEVICE APPLICATIONS.

MOLECULAR TECHNOLOGIES INC
145 MOORE ST
LOWELL, MA 01852
CONTRACT NUMBER:
DR JAYANT KUMAR
TITLE:
FAST OPTICAL SWITCHING AND OPTICAL DATA PROCESSING IN SEMICONDUCT PHOTOREFRACTIVE MATERIALS
TOPIC# 182 OFFICE: AFWL/PRC IDENT#: 27134

FAST AND SENSITIVE NONLINEAR OPTICAL MATERIALS ARE THE KEY TO THE SUCCESSFUL IMPLEMENTATION OF OPTICAL SWITCHING AND OPTICAL DATA PROCESSING. NOVEL ARCHITECTURES INVOLVING FOUR-WAVE MIXING AND TWO-BEAM COUPLING HAVE BEEN PROPOSED TO CONSTRUCT OPTICAL DATA PROCESSING ELEMENTS. FOR PRACTICAL APPLICATIONS, HOWEVER, MATERIALS SHOULD HAVE A REASONABLY FAST RESPONSE TIME, BUT AT THE SAME TIME SHOULD HAVE THE CAPABILITY OF EXHIBITING RELATIVELY LARGE NONLINEAR INDEX OF REFRACTION WITH DIODE LASER SOURCES. SEMICONDUCTOR PHOTOREFRACTIVE MATERIALS HAVE BEEN SHOWN TO HAVE RESPONSE TIME IN THE MICROSECOND REGIME FOR INTENSITY LEVELS OF WATTS/cm(2). MAINLY GaAs AND InP HAVE BEEN INVESTIGATED. THE TECHNICAL OBJECTIVES OF THIS PROPOSAL CALL FOR A DETAILED SURVEY OF SEMICONDUCTOR PHOTOREFRACTIVE MATERIALS TO IDENTIFY THE MATERIAL WITH OPTIMUM PROPERTIES. ONCE THE MATERIAL HAS BEEN IDENTIFIED, THEORETICAL PREDICTION OF ITS PERFORMANCE IN FOUR-WAVE MIXING AND TWO-BEAM COUPLING EXPERIMENTS WILL BE UNDERTAKEN UNDER DIFFERENT EXPERIMENTAL CONDITIONS. DARK AND PHOTOCONDUCTIVITY MEASUREMENTS WILL BE PERFORMED TO CONFIRM THE RESPONSE TIME AND TO EVALUATE THE SENSITIVITY OF THE MATERIAL AT LOW INCIDENT POWER LEVELS. ON THE BASIS OF THE INFORMATION OBTAINED FROM THE CALCULATIONS AND THE EXPERIMENTS PERFORMED APPROPRIATE DEVICE CONFIGURATIONS WILL BE SUGGESTED.

MOLLER INTERNATIONAL INC
1222 RESEARCH PARK DR
DAVIS, CA 95616
CONTRACT NUMBER:
DR PAUL S MOLLER
TITLE:
FRIENDLY AIRFIELD THREAT DETECTION AND DAMAGE ASSESSMENT
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 27002

SUBMITTED BY

A NEW APPROACH TO THE TASK OF AIRFIELD THREAT SURVEILLANCE AND AIRSTRIP INSPECTION BY THE USE OF AN INNOVATIVE, USER FRIENDLY, VTOL UNMANNED AERIAL VEHICLE IS DESCRIBED AND DEMONSTRATED. MOLLER INTERNATIONAL (MI) HAS DEVELOPED A PROOF-OF-CONCEPT UAV WHICH IS CAPABLE OF VERTICAL TAKEOFF AND LANDING (VTOL), AUTOMATICALLY STABILIZED FLIGHT, AND RADIO CONTROL. AT THE PRESENT TIME, HOWEVER IT IS AN EXPERIMENTAL SHORT RANGE, LIGHT PAYLOAD VEHICLE CONFINED TO FLYING IN DAYLIGHT HOURS AND IN CALM OR LIGHT WINDS. A DEMONSTRATION TO DETERMINE THE FEASIBILITY OF THIS INNOVATIVE APPROACH TO THE PROBLEM OF AIRFIELD INSPECTION WILL MAKE USE OF THE PROOF-OF-CONCEPT UAV. STARTING FROM A VERTICAL TAKEOFF, A FLIGHT UP TO 100 FEET IN ALTITUDE WILL SURVEY THE FAR SIDE OF BUILDINGS AND TREES BEFORE RETURNING FOR A VERTICAL LANDING. A LEVEL FLIGHT, A FEW FEET OFF THE GROUND WILL USE A TV CAMERA TO RELAY IMAGES OF GROUND DETAIL DOWN TO A FEW INCHES IN SIZE. IMAGE RESOLUTION CAPABILITY WITHOUT COSTLY GIMBAL STABILIZATION WILL BE EVALUATED. A STUDY IN PARALLEL WITH THE DEMONSTRATION WILL SEEK TO IDENTIFY THE OPERATIONAL CAPABILITIES NEEDED TO PROVIDE THREAT DETECTION AND DAMAGE ASSESSMENT ON FRIENDLY AIRFIELDS UNDER A MILITARY ENVIRONMENT FOR DAY/NIGHT AND ALL WEATHER CONDITIONS. THE RESULTS WILL PROVIDE A BASIS FOR A TRADE-OFF DESIGN AND SPECIFICATIONS FOR A MILITARY VEHICLE AND SUB-SYSTEMS TO PERFORM THIS VITAL MISSION.

MONAT ASSOCS
4 HOLLIS CT
CENTERPORT, NY 11721
CONTRACT NUMBER:
SEYMOUR M MONAT
TITLE:
A REAL TIME ICE DETECTION SYSTEM FOR STRUCTURES
TOPIC# 23 OFFICE: AEDC/DOT IDENT#: 28590

ICE ACCUMULATION ON STRUCTURES HAS LONG BEEN RECOGNIZED AS A SIGNIFICANT AND COSTLY PROBLEM FOR BOTH INDUSTRY AND FOR GOVERNMENT. AT PRESENT NO SYSTEM HAS BEEN DEVELOPED WHICH POSITIVELY DETECTS ICE PER SE, AND NOT MERELY POTENTIAL ICING CONDITIONS. OUR PROPOSAL IS TO DEVELOP A DETECTION SYSTEM WHICH WILL DEFINITIVELY REPORT THE PRESENCE OF ICE, AND WILL AUTOMATICALLY ACTIVATE A DEICING SYSTEM.

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WHEN ICE ACCUMULATION IS NO LONGER A PROBLEM, THE SYSTEM WILL BE ACTIVATED AUTOMATICALLY. THE OBJECTIVE OF OUR RESEARCH WILL BE TO DEVELOP A SMALL, RELATIVELY INEXPENSIVE DETECTING DEVICE WHICH CAN BE INSTALLED ON ANY STRUCTURE. THE DEVICE WILL MEASURE CHANGES WHICH OCCUR IN THE TRANSITION PERIOD DURING WHICH WATER CHANGES TO ICE. THESE CHANGES WILL BE INTERPRETED AND FORWARDED TO A RECORDING OR READOUT DEVICE WHICH WILL AUTOMATICALLY INSTITUTE DEICING PROCEDURES.

MOUNTAIN OPTECH
2830 WILDERNESS PL - STE F
BOULDER, CO 80301
CONTRACT NUMBER:
TIM PENNEY
TITLE:
LASER DISK DIGITAL BULK MEMORY (LDDBM)
TOPIC# 158 OFFICE: AFSTC IDENT#: 27089

IN ANY COMPUTER SYSTEM THERE ARE REQUIREMENTS FOR NONVOLATILE BULK MEMORY STORAGE/DATA RETRIEVAL. MAGNETIC DISK RECORDING HAS LONG BEEN THE POPULAR LOW COST METHOD FOR COMMERCIAL MEMORY, HOWEVER, IT HAS BEEN PLAGUED BY POOR RELIABILITY EVEN IN THE MOST BENIGN ENVIRONMENTS. A NEW TECHNOLOGY IS EMERGING THAT WOULD ELIMINATE THE DISADVANTAGES OF MAGNETIC RECORDING FOR HARSH ENVIRONMENT APPLICATIONS. THIS NEW TECHNOLOGY USES A LASER BEAM TO CAUSE A PHYSICAL CHANGE TO A RECORDING MEDIA AND IS REFERRED TO AS A LASER DISK OR OPTICAL DISK. WE WILL IDENTIFY THE APPLICATIONS OF THIS NEW TECHNOLOGY IN AVIONICS AND SPACE ENVIRONMENTS AND COMPARE THE SPECIFIC EMERGING TECHNOLOGIES FOR SIZE, WEIGHT, POWER, INPUT/OUTPUT SPEEDS. A COST AND RELIABILITY BREAKDOWN WILL ALSO BE PERFORMED. THE RESULT WILL BE A TECHNICAL PATH TO ACHIEVE A 1 GIGABYTE CAPACITY SPACE QUALIFIED DRIVE WITH HIGH RELIABILITY FOR EXTREME ENVIRONMENTS. THIS DRIVE WILL BE BASED UPON MOUNTAIN OPTECH'S SEVERE ENVIRONMENT LAND-BASED UNIT CURRENTLY IN PRODUCTION.

MSNW INC
PO BOX 865
SAN MARCOS, CA 92069
CONTRACT NUMBER:
DR GEORGE H REYNOLDS
TITLE:
DUCTILE REFRACTORY METAL REINFORCING PHASES FOR ADVANCED INTERMETALLIC MATRIX COMPOSITES
TOPIC# 112 OFFICE: AFWAL/ASD IDENT#: 26946

SUBMITTED BY

THE PROPOSED WORK WILL EXAMINE SYNTHESIS OF HIGH PURITY REFRACTORY METAL ALLOY PARTICULATES AND WHISKERS FOR USE AS DUCTILE REINFORCING PHASES IN ADVANCED INTERMETALLIC MATRIX COMPOSITES. PROTOTYPE DUCTILE REINFORCING PHASES WILL BE PREPARED AND THERMOCHEMICAL COMPATIBILITY TESTS WILL BE PERFORMED ON DISCONTINUOUSLY REINFORCED MODEL COMPOSITED WITH ADVANCED INTERMETALLIC MATRICES. THE PROJECT IS EXPECTED TO DEMONSTRATE THAT ADVANCED INTERMETALLIC MATRICES CAN BE REINFORCED WITH DISPERSED DUCTILE REFRACTORY METAL ALLOY PARTICULATES AND WHISKERS OF COMMPOSITIONS WHICH WILL BE THERMOCHEMICALLY STABLE AT ELEVATED TEMPERATURES. SUCH COMPOSITES ARE EXPECTED TO FIND APPLICATIONS IN ADVANCED, HIGH THRUST/WEIGHT PROPULSION SYSTEMS.

MSNW INC
PO BOX 865
SAN MARCOS, CA 92026
CONTRACT NUMBER:
DR GEORGE H REYNOLDS
TITLE:
METALLIC INHIBITION/PROTECTION SYSTEM FOR CARBON-CARBON COMPOSITE
TOPIC# 143 OFFICE: AFWAL/ASD IDENT#: 26987

THE PROPOSED WORK WILL EXAMINE POSSIBLE APPROACHES TOWARD A METALLIC INHIBITION/PROTECTION SYSTEM FOR CARBON-CARBON COMPOSITES. THE EFFORT WILL BE A COMBINED THEORETICAL/EXPERIMENTAL STUDY TO ANALYZE AND TEST OPTIONS FOR INHIBITION OF MATRICES AND SEALING THE NEAR-SURFACE REGIONS USING METAL OR ALLOY COMPOSITIONS. IN BOTH CASES, THE OXIDATION PRODUCT OF THE METAL OR ALLOY INHIBITION OR SEALANT MATERIALS WILL BE INSENSITIVE TO MOISTURE. MODEL PROTECTED MATRIX MATERIALS AND PROTECTED COMPOSITES WILL BE FABRICATED AND TESTED IN COMPARISON TO BASELINE (I.E. UNPROTECTED) COMMERCIAL MATRICES AND COMPOSITES. A METALLIC INHIBITION/PROTECTION SYSTEM FOR CARBON-CARBON COMPOSITES IS EXPECTED TO FIND APPLICATIONS IN LIGHTWEIGHT, OXIDATION-RESISTANT STRUCTURAL COMPONENTS FOR ADVANCED MAN-RATED TURBOJET ENGINES AS WELL AS IN UNMANNED VEHICLES.

MULTI-SPEC CORP
25 BLACK LATCH LN
CHERRY HILL, NJ 08003
CONTRACT NUMBER:
DR DAVID SHEBY
TITLE:
EVOLUTIONARY ENHANCEMENTS OF IMPULSE RADARS INTO BROAD BAND RADAR FOR IMPROVED EARLY WARNING AND SURVEILLANCE CAPABILITIES
TOPIC# 28 OFFICE: ESD/XRB IDENT#: 28598

SUBMITTED BY

THEORETICAL AND PRACTICAL CAPABILITIES OF IMPULSE RADARS ARE EXAMINED. ENHANCEMENTS TO THESE IMPULSE RADARS ARE SHOWN TO RESULT IN MORE POWERFUL CLASS OF BROAD-BAND RADARS FOR PRACTICAL TARGET/ CLUTTER DISCRIMINATION.

MUSTER D & ASSOCS INC
4615 O'MEARA DR
HOUSTON, TX 77035
CONTRACT NUMBER:
DOUGLAS MUSTER
TITLE:
PARTITIONING AND PLANNING AIDS FOR UNIFIED LIFE-CYCLE ENGINEERING DESIGN
TOPIC# 119 OFFICE: AFWAL/ASD IDENT#: 26956

WE ASSERT THAT THE PRINCIPAL ROLE OF AN ENGINEER IS TO MAKE DECISIONS ASSOCIATED WITH THE DESIGN OF AN ARTIFACT. WE DEFINE DECISION-BASED DESIGN AS THE PROCESS OF PARTITIONING, PLANNING AND MAKING DECISIONS TO DESIGN AND ARTIFACT THAT MEETS SPECIFIED OBJECTIVES. DECISION-BASED DESIGN IS A NEW TERM COINED TO EMPHASIZE A DIFFERENT PERSPECTIVE FROM WHICH TO DEVELOP METHODS FOR DESIGN. IN THE CONTEXT OF DECISION-BASED DESIGN WE PROPOSE TO DEVELOP FOR USE IN UNIFIED LIFE-CYCLE ENGINEERING DESIGN: A CONCEPTUAL MODEL FOR UNIFYING THE PROCESS ASSOCIATED WITH DESIGN, MANUFACTURING AND MAINTENANCE; THE MEANS TO PARTITION AN ARTIFCAT MODEL INTO SUBSYSTEMS AND COMPONENTS, AND THE MEANS TO DEVELOP A STRATEGY AND IMPLEMENT A PLAN OF ACTION FOR OBTAINING KNOWLEDGE ABOUT THE ARTIFACT SO THAT IT CAN BE MANUFACTURED.

MYK TECHNOLOGY INC
1140-P CENTRE DE
INDUSTRY, CA 91789
CONTRACT NUMBER:
DR YU-WEN CHANG
TITLE:
HIGH DYNAMIC RANGE MMW MIXER
TOPIC# 155 OFFICE: AFSTC IDENT#: 27086

SUBMITTED BY

BALANCED AND DOUBLE-BALANCED MILLIMETER WAVE GaAs MESFET MIXERS ARE PROPOSED IN CROSSBAR CONFIGURATIONS FOR HIGH DYNAMIC RANGE REALIZATION USING THE WEAKLY NON-LINEAR CHANNEL RESISTANCE OF THE DEVICE AND THE BROADBAND LO/RF ISOLATION OF THE CROSSBAR CIRCUITS.

MYK TECHNOLOGY INC
1140-P CENTRE DR
INDUSTRY, CA 91789
CONTRACT NUMBER:
DR KeLi WANG
TITLE:
60 GHz IMPATT DIODES
TOPIC# 157 OFFICE: AFSTC IDENT#: 27088

DOUBLE DRIFT 60 GHz GaAs IMPATT DIODES ARE PROPOSED FOR SPACE SYSTEM APPLICATIONS. HIGH EFFICIENCY IMPATT STRUCTURES PERFORMANCE SUCH AS GaAs "READ" IS LIMITED BY MATERIAL GROWTH TECHNOLOGY TO FABRICATE VERY THIN n AND p LAYERS, AND BY HEATSINK TECHNIQUE. MOCVD IS PROPOSED FOR THE DIODE DOPING PROFILE GROWTH AND A DOUBLE HEATSKIN IS PROPOSED FOR HEAT DISSIPATION. TRADE-OFFS OF DIFFERENT IMPATT STRUCTURE WILL BE CONDUCTED FOR APPLICATIONS MEETING SPACE SYSTEM REQUIREMENTS.

MacAULAY-BROWN INC
3915 GERMANY LN
DAYTON, OH 45431
CONTRACT NUMBER:
DONALD SMITH
TITLE:
EW REQUIREMENTS FOR HYPERVELOCITY VEHICLES
TOPIC# 78 OFFICE: AFWAL/ASD IDENT#: 26897

THE USE OF EW ON A HYPERVELOCITY VEHICLE AND IN A HIGH SPEED, HIGH ALTITUDE FLIGHT REGIME PRESENTS SOME UNIQUE OPPORTUNITIES AND PROBLEMS AS CONTRASTED WITH LOW ALTITUDE LOWER SPEED FLIGHT PROFILES. DIFFERENCES IN TACTICS, SIGNATURES, RESPONSE TIMES, EFFECTIVE

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THREATS, AND ENVIRONMENTAL CONDITIONS ARE OBVIOUS FACTORS THAT MAKE HYPERVELOCITY VEHICLE EW A POTENTIALLY DIFFERENT ENTITY THAN MORE CONVENTIONAL VEHICLE EW SYSTEMS. IT IS IMPORTANT TO HAVE THE GENERAL REQUIREMENTS AND STRUCTURE OF A HYPERVELOCITY VEHICLE EW SYSTEM DEFINED PRIOR TO EXTENSIVE DEVELOPMENT OF THE VEHICLE ITSELF. THE BASIC PURPOSE OF THIS PROPOSED PHASE I PROGRAM IS TO START THE PROCESS OF DEFINING THE HYPERVELOCITY VEHICLE EW REQUIREMENTS. A SUCCESSFUL EFFORT IN PHASE I WILL RESULT IN THE DEFINITION OF GENERAL EW REQUIREMENTS FOR HYPERVELOCITY VEHICLES AND IN THE IDENTIFICATION OF CRITICAL TECHNOLOGY AREAS THAT NEED FURTHER WORK OR MATURITY BEFORE THEY CAN BE APPLIED TO HYPERVELOCITY VEHICLE EW SUITES.

McCABE W M
1359 - N 79TH ST
SEATTLE, WA 98103
CONTRACT NUMBER:
W MARTIN McCABE
TITLE:
DAMAGE MEASUREMENT SYSTEM FOR REINFORCED CONCRETE STRUCTURES
TOPIC# 186 OFFICE: AFWL IDENT#: 27141

**NEED READABLE ABSTRACT (8 JUN 88).

NESTOR INC
1 RICHMOND SQ
PROVIDENCE, RI 02906
CONTRACT NUMBER:
DR DOUGLAS L REILLY
TITLE:
MULTISENSOR INFORMATION PROCESSING USING A MULTIPLE NEURAL NETWOR LEARNING SYSTEM
TOPIC# 83 OFFICE: AFWAL/ASD IDENT#: 26905

THE OBJECTIVE IS TO DEMONSTRATE THE FEASIBILITY OF USING NESTOR'S NEURAL NETWORK LEARNING TECHNOLOGY FOR PATTERN RECOGNITION IN A MULTISENSOR AVIONICS SYSTEM ENVIRONMENT. PATTERN MATCHING VIA PARALLEL SEARCHES IN A MULTISENSOR DATA ENVIRONMENT MUST BE CON-

SUBMITTED BY

TROLLED BY AN APPROPRIATE HIERARCHICAL DECISION LOGIC THROUGH WHICH A SYSTEM CAN LEARN HOW BEST TO USE ITS AVAILABLE DATA FOR ROBUST RECOGNITION. NESTOR HAS PIONEERED A NOVEL SYSTEMS APPROACH TO USING MULTIPLE NEURAL NETWORKS FOR PATTERN RECOGNITION, WHERE EACH COMPONENT NETWORK OF THE SYSTEM CAN BE CONFIGURED TO PROCESS INFORMATION FROM A SINGLE SENSOR OR MULTIPLE SENSORS. A HIGH LEVEL CONTROLLER, OPERATING ON THE SYMBOLIC OUTPUT OF INDIVIDUAL NETWORKS, INTEGRATES THEIR RESPONSES AND DETERMINES FEEDBACK TRAINING SIGNALS. THIS TECHNOLOGY HAS BEEN SUCCESSFULLY APPLIED TO PATTERN RECOGNITION PROBLEMS IN CHARACTER RECOGNITION, VISUAL OBJECT RECOGNITION AND THE SIMULATION OF HUMAN EXPERT DECISION MAKING. WE PROPOSE TO ASSESS THE PERFORMANCE OF THE SYSTEM ON REAL-WORLD MULTISENSOR DATA TO SHOW THE FEASIBILITY OF USING THE TRAINABLE DECISION-MAKING LOGIC OF THE SYSTEM FOR MULTISENSOR PROCESSION IN AN AVIONICS ENVIRONMENT.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER:
ANDREW T TEXTORIS
TITLE:
CONTROLLED EMISSIVITY MATERIALS
TOPIC# 144 OFFICE: AFWAL/ASD IDENT#: 26989

THE COMBINED USE OF MULTIPLE SENSORS SUCH AS VISIBLE OPTICS, FLIRS, AND THERMAL IMAGERS HAS CREATED A NEED TO CONTROL THE MULTI-SPECTRAL SIGNATURES OF HIGH VALUE TARGETS. NRC IS PROPOSING A PHASE I PROGRAM AIMED AT THE DEVELOPMENT OF A METHODOLOGY FOR SELECTING AND CONTROLLING THE EMISSIVITY OF PAINTS AND COATINGS FOR LOW OBSERVABLE APPLICATIONS. THE KEY ELEMENT IN THIS PROPOSED EFFORT IS AN AVAILABLE COMPUTER CODE CALLED SEPAC (SPECTRAL EMITTANCE OF PAINTS AND COATINGS) WHICH WILL BE USED TO CALCULATE (FROM FIRST PRINCIPALS) THE SURFACE OPTICAL PROPERTIES OF PAINTS AND COATINGS. PRIOR RESULTS OBTAINED WITH SEPAC HAVE SHOWN GOOD AGREEMENT WITH EMISSIVITY MEASUREMENTS ON SOME SPECIFIC PAINT AND COATING SYSTEMS. THE OBJECTIVE OF THE PHASE I PROGRAM IS TO FORMULATE, FABRICATE, AND EVALUATE SPECIFIC BINDER/PIGMENT COMBINATIONS FOR PROOF OF CONCEPT.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER:
JAMES R WESSEL
TITLE:
DESIGN PRODUCIBILITY ASSESSMENT
TOPIC# 221 OFFICE: BMO/MYSC IDENT#: 28637

SUBMITTED BY

THE OBJECTIVE OF THIS EFFORT IS TO DEVELOP AN EXPERT KNOWLEDGE BASED, INTERACTIVE MODEL FOR DESIGN PRODUCIBILITY ASSESSMENT. THE CONCEPT FOR DEVELOPING THE INTERACTIVE MODEL IS TO TIE AN ESTABLISHED EXPERT SYSTEM SOFTWARE SHELL TO AN EXISTING DATA BASE SHELL THAT WILL ACCOMMODATE INTERACTIVE PROCESSING WITH OTHER ALGORITHM MODULES. THE APPROACH TO PRODUCIBILITY ASSESSMENT WILL BE BASED ON THE ANALYTICAL HIERARCHY PROCESS WHEREBY DESIGN PRODUCIBILITY CRITERIA WILL BE ARRANGED IN A HIERARCHICAL STRUCTURE AND WEIGHTED BASED ON EXPERT OPINION OF THEIR RELATIVE IMPORTANCE. DESIGN ALTERNATIVES CAN THEN BE RATED VERSUS THE WEIGHTED CRITERIA AND THE RESULTS SYNTHESIZED INTO AN OVERALL FIGURE OF MERIT FOR THE PRODUCIBILITY OF A GIVEN DESIGN. PHASE I WILL ENTAIL A SIMPLE STRUCTURING OF THE EXPERT SYSTEM AND DATA BASE SHELLS, AS WELL AS DEVELOPMENT OF A RUDIMENTARY ALGORITHM TO MODEL THE DESIGN PRODUCIBILITY ASSESSMENT PROCESS. THE RESULT OF PHASE I WILL BE PROOF OF CONCEPT. PHASE II WILL ENTAIL DEVELOPMENT OF A NATURE INTERACTIVE DESIGN PRODUCIBILITY ASSESSMENT MODEL WITH ENOUGH BREADTH IN THE RELATIONAL ALGORITHM MODULES AND DEPTH IN THE EXPERT SYSTEM TO ENABLE THOROUGH AND EFFECTIVE PRODUCIBILITY ASSESSMENTS ON ANY TYPE OF HARDWARE DESIGN.

NIELSEN ENGINEERING & RESEARCH INC
510 CLYDE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER:
ROBERT E CHILDS
TITLE:
A COMPUTATIONAL MODEL FOR THRUST REVERSING AND VECTORED JETS
TOPIC# 104 OFFICE: AFWAL/ASD IDENT#: 26933

BECAUSE OF RECENTLY DEFINED TACTICAL THREATS IT IS DESIRABLE TO IMPROVE THE MANEUVERABILITY AND TAKE-OFF/LANDING ASPECTS OF AIRCRAFT PERFORMANCE. IT HAS BEEN DETERMINED THAT SUCH IMPROVEMENTS CAN BE ACCOMPLISHED BY THE USE OF THRUST REVERSERS OR VECTORED JETS. IN ORDER TO DESIGN AIRCRAFT SATISFACTORILY IT IS NECESSARY TO HAVE A PREDICTION METHOD THAT IS SUFFICIENTLY ACCURATE. THE MOST DIFFICULT FLIGHT REGIME TO PREDICT ACCURATELY IS THE LANDING CONFIGURATION WHEN THERE ARE HOT GAS JETS IMPINGED ON THE GROUND CAUSING COMPLEX AERODYNAMIC PHENOMENA THAT CAN CRITICALLY AFFECT STABILITY AND CONTROL OF

SUBMITTED BY

THE AIRCRAFT. PREVIOUS RESEARCH HAS INDICATED THAT ACCURATE MODELING OF THE TURBULENCE IN THE FLOW IS CRITICAL. THIS PROPOSAL IS CONCERNED IN PHASE I WITH IDENTIFYING THOSE AREAS WHERE EXISTING TURBULENCE MODELS ARE INADEQUATE AND ASSESSING THE IMPORTANCE OF THESE AREAS TO THE ACCURATE PREDICTION OF THE AIRCRAFT STABILITY AND CONTROL.

NIELSEN ENGINEERING & RESEARCH INC
510 CLYDE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: F49620-88-C-0097
DAVID NIXON
TITLE:
EXPLOITATION OF MULTIPLE SOLUTIONS OF THE NAVIER-STOKES EQUATIONS TO ACHIEVE RADICALLY IMPROVED FLIGHT
TOPIC# 231 OFFICE: AFOSR/NA IDENT#: 28647

IT IS KNOWN THAT THE NONLINEAR NAVIER-STOKES EQUATIONS WILL MODEL MOST FLUID FLOW OF AERONAUTICAL INTEREST. THE EXISTENCE AND UNIQUENESS OF THE SOLUTION TO THE NAVIER-STOKES EQUATIONS HAVE NOT BEEN PROVEN ALTHOUGH IT IS SHOWN THAT IN CERTAIN INSTANCES MORE THAN ONE SOLUTION CAN BE FOUND. IN A WIND TUNNEL TEST OF THESE CASES ONLY THE MOST STABLE SOLUTION IS OBTAINED. THIS PROPOSAL IS CONCERNED WITH INDENTIFYING MULTIPLE SOLUTIONS OF THE NAVIER-STOKES EQUATIONS AND DETERMINING IF THESE NON-CONVENTIONAL BUT UNSTABLE SOLUTIONS WOULD GIVE RADICALLY IMPROVED FLIGHT. THESE SOLUTIONS CAN PROBABLY EXIST ONLY IF THERE ARE SHOCK WAVES, SLIP SURFACES, OR CONCENTRATED VORTICES IN THE FLOW. THE MAIN OBJECTIVE IS TO EXPLOIT THE EXISTENCE OF THESE SOLUTIONS RATHER THAN AVOID THEM AS HAS BEEN THE CUSTOM IN THE PAST.

NORTH AMERICAN DYNAMICS
1541-F PARKWAY LOOP
TUSTIN, CA 92680
CONTRACT NUMBER:
RICHARD E DODD
TITLE:
LOADING SYSTEM FOR ADVANCED GUN TECHNOLOGY (AGT) CASED TELESCOPED AMMUNITION
TOPIC# 13 OFFICE: AD/PMR IDENT#: 23376

SUBMITTED BY

THE PROJECT OBJECTIVE IS TO DEFINE A SIMPLE LIGHTWEIGHT AMMUNITION LOADING SYSTEM CAPABLE OF SIMULTANEOUSLY LOADING AND DOWNLOADING CASED TELESCOPED AMMUNITION INTO AND FROM THE GUN SYSTEM INSURING PROPER ORIENTATION OF THE ROUNDS, PROTECTING AMMUNITION FROM HANDLING HAZARDS AND FUNCTIONING UNDER A WIDE RANGE OF ENVIRONMENTAL CONDITIONS.

NTS ENGINEERING
6695 E PACIFIC COAST HWY
LONG BEACH, CA 90803
CONTRACT NUMBER:
YOLANDA JACQUES
TITLE:
HOLOGRAPHIC TARGET CLOAKING FROM TACTICAL LASER DETECTION
TOPIC# 90 OFFICE: AFWAL/ASD IDENT#: 26915

ACTIVE AND PASSIVE TECHNIQUES TO CLOAK A TARGET WILL ULTIMATELY DETERMINE ITS ABILITY TO SURVIVE BY AVOIDING DETECTION AND TRACKING. HOLOGRAPHIC TECHNOLOGY HAS THE UNIQUE COMPATIBILITY OF BEING ABLE TO DEFLECT INCOMING RADIATION IN A PATTERN THAT IS DETERMINED WHEN THE HOLOGRAPHIC FILM IS MADE. THUS, THE POSSIBILITY OF HAVING THE BEAM FROM A LASER RANGEFINDER, FOR EXAMPLE, COMPLETELY MISDIRECTED AWAY FROM AN AIRCRAFT (MISSILE) IN A DIRECTION THAT IS ADVANTAGEOUS FOR AVOIDING DETECTION IS CURRENTLY WITHIN THE STATE OF THE ART. HOLOGRAPHIC TECHNOLOGY HAS THE ABILITY TO REJECT VERY NARROW WAVELENGTH BANDS (DELTA LAMBDA = 20nm) OR VERY BROAD BANDS (DELTA LAMBDA = 400nm) OF THE VISIBLE AND INFRARED SPECTRAL REGIONS. HOLOGRAPHIC MIRRORS CAN BE TUNED TO REFLECT SPECIFIC LASER WAVELENGTHS WITH REFLECTIVITIES OF 99.9% (EXPERIMENTALLY MEASURED). IT CAN DO THIS WITH HIGH OPTICAL DENSITY (OD >6). APPLICATIONS OF CLOAKING TO MILITARY DEVICES AND SENSORS FROM TACTICAL LASERS APPEARS STRAIGHTFORWARD.

NTS ENGINEERING
6695 E PACIFIC COAST HWY
LONG BEACH, CA 90803
CONTRACT NUMBER:
PAUL LYNN
TITLE:
ZERO GRAVITY SUSPENSION SYSTEMS
TOPIC# 169 OFFICE: AFAL IDENT#: 27113

SUBMITTED BY

FUTURE U.S. AIR FORCE MISSIONS WILL REQUIRE THE DEVELOPMENT OF LARGE FLEXIBLE SPACE STRUCTURES. EARTH-BOUND TEST FACILITIES, SIMULATING THE OUTERSPACE WEIGHTLESS, VACUUM, AND SEVERE HEAT GAIN-LOSS ENVIRONMENT, ARE NECESSARY IN THE R&D OF LIGHTWEIGHT AND FLEXIBLE SPACE STRUCTURAL ENGINEERING DESIGNS. HOWEVER, RECENT ATTEMPTS IN CREATING THE WEIGHTLESS ENVIRONMENT USING VARIOUS METHODS, SUCH AIR FLOORS, HELIUM BALLOONS, AND WATER FLOAT SYSTEMS, HAVE MET WITH LIMITED SUCCESS. NTS PROPOSES AN INNOVATIVE MAGNETIC SUSPENSION SYSTEM TO COUNTERACT THE PULL OF GRAVITY BY PROVIDING CONSTANT UPLIFT TO THE TEST STRUCTURE WHILE KEEPING ADDITIONAL STIFFNESS, VISCOUS DAMPING, AND MATERIAL MASS COUPLED TO THE TEST STRUCTURE TO A MINIMUM LEVEL, FAR BELOW ANY PREVIOUS APPROACH PHASE I WOULD INVOLVE THE ANALYSIS, DESIGN, AND FABRICATION OF THE PROPOSED PROTOTYPE MAGNETIC SUSPENSION SYSTEMS FOR EXPERIMENTAL FEASIBILITY DEMONSTRATION. THE MAGNETIC UPLIFT FORCE VERSUS DISPLACEMENT RELATIONSHIP IS TO BE EXPERIMENTALLY ESTABLISHED. IN CONJUNCTION WITH THE MAGNETIC CONSTANT FORCE SUSPENSION SYSTEM, NTS PROPOSES OTHER INNOVATIVE CONCEPTS FOR A ZERO-GRAVITY VACUUM TEST FACILITY, TO BE STUDIED IN DETAIL DURING THE PHASE II R&D WORK.

NU-TECH INDUSTRIES INC
5905 WOLF CREEK PIKE
DAYTON, OH 45426
CONTRACT NUMBER:
ANTHONY P LIOI
TITLE:
DURABLE HEART DIAPHRAGM FROM ORDERED POLYMER FILMS
TOPIC# 110 OFFICE: AFWAL/ASD IDENT#: 26943

THE PROPOSED PROGRAM IS AIMED AT DEVELOPING STRONG TOUGH ORDERED POLYMER FILMS FOR FLEXURAL FATIGUE LOADING. ORDERED POLYMERS HAVE BEEN DEVELOPED BY THE U.S. AIR FORCE PRIMARILY AS HIGH STRENGTH LIGHTWEIGHT AEROSPACE STRUCTURAL MATERIALS, BUT THEY CAN PROVIDE MAJOR IMPROVEMENTS IN BIOMEDICAL APPLICATIONS AS WELL. THE LONG TERM OBJECTIVE IS TO EVALUATE THE POTENTIAL OF THE ORDERED POLYMER PBZT (POLY P-PHENYLENE BENZOBISTHIAZOLE) TO PROVIDE A DURABLE HEART DIAPHRAGM, EXCEEDING THE FATIGUE LIFE OF CURRENT MATERIALS. PBZT FILM HAS AN ORIENTED, INTERCONNECTED "MOLECULAR FABRIC" THAT PROMISES TO

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HAVE EXTREMELY HIGH FLEX LIFE AS WELL AS HIGH STRENGTH BECAUSE OF ITS UNIQUE MICROSTRUCTURE. A FLEX LIFE TEST RIG THAT ACHIEVES A SUITABLE BALANCE BETWEEN SPEED OF TESTING AND PROPER FLEXURAL EXCURSION WILL BE DESIGNED, BUILT AND EVALUATED. PBZT WILL BE EVALUATED FOR FLEXURAL FATIGUE LIFE IN COMPARISON WITH A POLYURETHANE CURRENTLY USED IN ARTIFICIAL BLOOD PUMPS.

ODETICS INC (AIM DIVISION)
1515 S MANCHESTER AVE
ANAHEIM, CA 92802
CONTRACT NUMBER:
DR TIM LARSON
TITLE:
DUAL ROBOTIC ARM FORCE REFLECTION ALGORITHMS
TOPIC# 73 OFFICE: AAMRL/HSD IDENT#: 26889

IN THE CONTROL OF TELEPRESENCE ROBOTIC SYSTEMS, THE INTERACTION OF THE HUMAN OPERATOR WITH THE MECHANICAL COMPONENTS OF THE SYSTEM IS CRITICAL. IDEALLY, THE REMOTE OPERATOR SHOULD HAVE THE "SENSATION" THAT HE IS PRESENT AT THE WORK SITE CARRYING OUT THE SPECIFIED TASK. THIS PROPOSAL ADDRESSES THE ISSUE OF FORCE FEEDBACK BY PROPOSING TO PLACE THE OPERATOR'S ARM IN AN EXOSKELETON WITH SEVEN DOF THAT MIMIC THE DOF OF THE HUMAN ARM. THE EXOSKELETON CAN EXERT FORCES ON THE OPERATOR'S ARM BY APPLYING TORQUES TO THE JOINTS OF THE EXOSKELETON. DURING PHASE I, ODETICS WILL 1) DEVELOP AND VERIFY THE TRANSFORMATION ALGORITHMS TO REFLECT FORCES AND MOMENTS ACTING AT THE END-EFFECTORS OF TWO ROBOTIC MANIPULATORS BACK TO A HUMAN WEARING A DUAL-ARM EXOSKELETON SYSTEM; AND 2) ASSESS THE FEASIBILITY OF A HAND RECEPTACLE PROVIDING FORCE AND POSITION FEEDBACK TO THE OPERATOR FROM A DEXTEROUS END-EFFECTOR ON THE ROBOTIC ARM.

OPTRA INC
83 PINE ST
PEABODY, MA 01960
CONTRACT NUMBER:
DAVID VOORHES
TITLE:
SMALL GAGE LENGTH LASER EXTENSOMETER
TOPIC# 113 OFFICE: AFWAL/ASD IDENT#: 26947

SUBMITTED BY

OPTRA WILL DEMONSTRATE A SMALL GAGE LENGTH LASER EXTENSOMETER CAPABILITY FOR USE WITH SMALL TEST PIECES AND/OR FRACTURE ANALYSIS. THE EXTENSOMETER WILL USE AN ARRAY DETECTOR TECHNIQUE WHICH WILL (a) ALLOW SIMULTANEOUS MONITORING OF STRAIN AT A LINEAR ARRAY OF POINTS ON THE SURFACE, AND (b) ALLOW FRACTURE GROWTH TO BE ACCURATELY MONITORED WITHOUT A PRIORI KNOWLEDGE OF THE EXACT LOCATION OF THE FRACTURE. GAGE LENGTHS RANGING FROM 0.01 INCH TO 0.25 INCH WILL BE POSSIBLE USING THIS TECHNIQUE. THE SYSTEM WILL APPROACH MICROSTRAIN RESOLUTION AND WILL HAVE AN ELECTRICAL BANDWIDTH SUFFICIENT FOR HIGH FREQUENCY CYCLIC TESTING. THE SYSTEM WILL BE ABLE TO MEASURE IN-PLANE SHEAR STRAIN AS WELL AS IN-PLANE AXIAL STRAIN, AND WILL ALLOW ANALYSIS OF BOTH MODE I AND MODE II FRACTURE GROWTH. THE SYSTEM WILL BE NON-CONTACTING, WILL GENERALLY REQUIRE NO SAMPLE PREPARATION, AND WILL BE IDEALLY SUITED TO HIGH TEMPERATURE STUDIES.

ORBITIAL SYSTEMS LTD
PO BOX 700
LANHAM, MD 20706
CONTRACT NUMBER:
WILLIAM ROGERS
TITLE:
REDUCTION OF SPACE SYSTEMS COSTS VIA USE OF EXPERT SYSTEMS
TOPIC# 165 OFFICE: AFSD IDENT#: 27103

A NOVEL AND INNOVATIVE APPLICATION OF AN EXPERT KNOWLEDGE-BASED SYSTEM (KBS) TO SPACE SYSTEMS IS PROPOSED. A KBS DESIGN CONCEPT WILL BE DEVELOPED TO AUTONOMOUSLY MANAGE AND OPERATE SPACE GROUND SUPPORT SYSTEMS. IN PHASE I, THE KBS DESIGN WILL BE EVALUATED AS A TOOL IN INCREASING EFFICIENCY, RELIABILITY, MISSION SUCCESS, AND SAFETY; TO REDUCE COSTS OF MANAGEMENT, DESIGN INTEGRATION AND TEST; AND TO OPTIMIZE MISSION PLANNING, REAL-TIME PLACEMENT IN ORBIT AND REAL-TIME OPERATION OF SPACE SYSTEMS. THE KEY FACTORS IN SPACE SYSTEMS WHICH CONTRIBUTE TO LIFE CYCLE COSTS WILL BE DELINIATED AND RANKED. THESE WILL COMPRISE THE PRIMARY AREAS TO TARGET FOR OPERATION BY A HIGHLY AUTONOMOUS VEHICLE AND MISSION MANAGEMENT SYSTEM, A PORTION OF WHICH IS TO BE APPLIED TO SPACE SYSTEMS (AS OPPOSED TO LAUNCH PROCESSES, SEE AF88-164). THE RESEARCH WILL YIELD AN AI DEVELOPMENT DATABASE, A TOOL FOR ASSESSING THE RISK OF KBS DEVELOPMENT, AND A METHODOLOGY

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FOR PERFORMING TRADE-OFF ANALYSES TO IDENTIFY THE MOST BENEFICIAL APPLICATIONS OF KBS TECHNOLOGY TO THE SPACE SYSTEMS PROBLEM. FINALLY, THE STUDY WILL DETERMINE THE MAXIMUM DEGREE OF AUTONOMY THAT CAN BE DELEGATED TO ON-BOARD VMMS, ESTABLISH REQUIREMENTS FOR COMPLEMENTARY GROUND SYSTEMS, AND SELECT THE MOST BENEFICIAL SOLUTION FOR EACH CLASS OF SPACE SYSTEM.

ORLANDO TECHNOLOGY INC
PO BOX 855
SHALIMAR, FL 32579
CONTRACT NUMBER:
DANIEL A MATUSKA
TITLE:
COMPUTATIONAL MODEL FOR BINARY AND OTHER ENHANCED BLAST EXPLOSIVE
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23279

THIS PROPOSED EFFORT IS TO EVALUATE THE FEASIBILITY OF DEVELOPING A COMPUTER CODE TO MODEL THE MECHANICAL AND CHEMICAL PROCESSES DESCRIPTIVE OF MULTI-COMPONENT FUEL/OXIDIZER EXPLOSIVE SYSTEMS. THE RESULTING COMPUTER CODE COULD BE USED TO CONDUCT PARAMETRIC INVESTIGATION OF BINARY AND ENHANCED BLAST EXPLOSIVE SYSTEMS. THIS TYPE OF TOOL IS NECESSARY TO PERMIT OPTIMIZATION OF THESE BLAST SYSTEMS FOR MILITARY APPLICATIONS.

ORTEL CORP
2015 W CHESTNUT ST
ALHAMBRA, CA 91803
CONTRACT NUMBER:
DAVID B HUFF
TITLE:
LASER DISTORTION REDUCTION USING ACTIVE OPTICAL FEEDBACK
TOPIC# 84 OFFICE: AFWAL/ASD IDENT#: 26906

WITH LASER DIODES, A PORTION OF THE OUTPUT OPTICAL SIGNAL CAN BE CONVERTED TO AN ELECTRICAL SIGNAL AND COMPARED WITH THE INPUT ELECTRICAL SIGNAL. THIS COMPARISON GENERATES AN ERROR SIGNAL WHICH, WHEN AMPLIFIED AND APPLIED TO THE LASER, TENDS TO CANCEL DISTORTIONS

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PRESENT IN THE OPTICAL SIGNAL. THIS TECHNIQUE IS SIMILAR TO NEGATIVE FEEDBACK EMPLOYED IN LOW DISTORTION AMPLIFIERS. USING FEEDBACK, SECOND AND THIRD ORDER DISTORTION PRODUCTS IN LASERS CAN BE REDUCED.

OSBORNE A ASSOCS
756 LAKEFIELD RD - BLDG J
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER:
ROGER LOILER
TITLE:
P CODELESS GPS IONOSPHERIC CALIBRATION SET
TOPIC# 178 OFFICE: AFGL IDENT#: 27126

THE OBJECTIVE OF THE PROGRAM IS TO DERIVE A GPS SATELLITE RECEIVER WHICH CAN PERFORM MEASUREMENTS OF THE IONOSPHERE'S DELAY OF RF SIGNALS, ON-LINE, IN A COST EFFECTIVE MANNER. BY MEASURING THE DIFFERENTIAL DELAYS IN EACH SATELLITE'S TRANSMISSIONS ON ITS TWO FREQUENCY CHANNELS, L(1) AND L(2), CONTINUOUS MEASURES OF THE TOTAL ELECTRON CONTENT (TEC) OF THE IONOSPHERE ALONG THE LINES OF SIGHT TO THE SATELLITES MAY BE MADE. THE DEVELOPMENT CONTEMPLATES PERFORMING THE MEASUREMENTS ON EACH OF THE CHANNELS WITHOUT REQUIRING KNOWLEDGE OF THE PRECISION (P) CODE, THEREBY RELIEVING PROBLEMS OF POTENTIAL UNAVAILABILITY OF THAT CODE. THE PROJECT BEGINS WITH A DESIGN FOR SUCH A RECEIVER WHICH GENERATES ONLY REPLICA C/A (CLEAR/ACCESS) CODES BUT WHICH ALSO TRACKS P-CODES DIFFERENTIALLY. OPERATION OF SUCH A RECEIVER ESTABLISHES FEASIBILITY, BUT THE DESIGN REQUIRES REFINEMENTS TO OVERCOME ACCURACY LIMITATIONS IMPOSED BY ANTENNA PROPERTIES, SIGNAL MULTIPATH AND PHASE SHIFT CONTROL WITHIN THE RECEIVER'S CHANNELS. REFINEMENTS TO THE DESIGN INVOLVING THE TIMING OF DATA SAMPLES ARE EXPECTED TO PROVIDE PERFORMANCE GAINS IN WIDER TRACKING BANDWIDTHS AND IN THE ABILITY TO DISCRIMINATE SIGNAL AMPLITUDE VARIATIONS DUE TO SCINTILLATION EFFECTS WITH THE IONOSPHERE.

PACIFIC MONOLITHICS
245 SANTA ANA CT
SUNNYVALE, CA 94086
CONTRACT NUMBER:
STEVE MacCABE
TITLE:
MINIATURIZED GLOBAL POSITIONING SYSTEM (GPS) RECEIVERS AND TRANSLATORS FOR SPACE TEST AND EVALUATION
TOPIC# 188 OFFICE: AFWL/PRC IDENT#: 27145

SUBMITTED BY

BECAUSE OF THE NATURE OF SDI TECHNOLOGY DEMONSTRATIONS, GPS HARDWARE IS AN ESSENTIAL PART OF EACH TEST. HOWEVER, SYSTEMS TO BE TESTED ARE THEMSELVES COMPACT AND POWER-EFFICIENT, AND THEREFORE THE GPS RECEIVING EQUIPMENT IS SUBJCET TO TIGHT SPACE, WEIGHT AND POWER CONSTRAINTS. THIS PROJECT WILL DEFINE THE ACTUAL CIRCUIT CONFIGURATION AND MECHANICAL ASSEMBLY FOR AN EXTREMELY COMPACT GPS TRANSCEIVER AND TRANSDIGITIZER. A GaAs MMIC-BASED CHIP SET WILL BE SPECIFIED FOR MINIATURIZED ELECTRICAL COMPONENTS.

PDA ENGINEERING
2975 REDHILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
DR LARRY A HARRAH
TITLE:
AN ABSORPTION-BASED OPTRODE FOR AROMATIC HYDROCARBON DETECTION
TOPIC# 61 OFFICE: AFESC/RDXP IDENT#: 23237

REMOTE FIBER SPECTROSCOPY COUPLED WITH FIBER OPTIC CHEMICAL SENSORS HAS SHOWN PROMISE FOR GROUNDWATER MONITORING. LASER-INDUCED FLUORESCENCE HAS BEEN PRINCIPAL DIAGNOSTIC TECHNIQUE INVESTIGATED FOR THE MEASUREMENT OF ORGANOCHLORIDES AND OTHER COMMON GROUNDWATER CONTAINMENTS. LABORATORY AND MODEL FIELD TESTS HAVE INDICATED EXCELLENT SENSITIVITY FOR THESE CHEMICAL SPECIES. EXTENSION OF THIS DIAGNOSITC APPROACH TO AROMATIC HYDROCARBONS AND A PRACTICAL FIELD SYSTEM, HOWEVER, HAS MAJOR LIMITATIONS. AN ALTERNATIVE FIBER OPTIC CHEMICAL SENSOR APPROACH, BASED ON ABSORPTION PHENOMENA, IS PROPOSED FOR THE MONITORING OF AROMATIC HYDROCARBONS. THE SENSOR WILL CONSIST OF AN OPTICAL FIBER SHEATHED WITH A POLYMER HOST CONTAINING AN AROMATIC HYDROCARBON-SPECIFIC REAGENT. THE USE OF LIGHT EMITTING DIODES OPERATING AT DIFFERENT WAVELENGTHS WILL ALLOW SPECIFIC HYDROCARBONS TO BE MEASURED. PARTS PER BILLION SENSITIVITY IS ANTICIPATED ALONG WITH FAST RESPONSE TIME AND REVERSIBLE CHARACTERISTICS. A FIELD SYSTEM SHOULD BE PRACTICAL AND LOW COST. PHASE I WILL INVESTIGATE CANDIDATE REAGENTS AND POLYMER HOSTS; MEASURE EXTINCTION COEFFICIENTS EQUILIBRATION RATES AND SPECTRA; AND FABRICATE AN OPTICAL WAVEGUIDE FOR CALIBRATION EXPERIMENTS.

PDA ENGINEERING
2975 REDHILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
PATRICK SHEEHAN
TITLE:
EXPERT SYSTEMS APPLIED TO VULNERABILITY ASSESSMENTS
TOPIC# 96 OFFICE: AFWAL/ASD IDENT#: 26922

SUBMITTED BY

PDA PROPOSES TO CONDUCT A FEASIBILITY STUDY ON THE EMPLOYMENT OF THREE TECHNOLOGIES TO IMPROVE THE PREPROCESSING TECHNIQUES APPLIED TO INPUT DATA FOR VULNERABILITY ASSESSMENT COMPUTER CODES. THIS STUDY WILL EVALUATE COMPUTER GRAPHICS SYSTEMS, DATABASE MANAGEMENT SYSTEMS, AND EXPERT OR KNOWLEDGE BASED SYSTEMS TECHNOLOGIES. THE OBJECTIVE IS TO DETERMINE IF ANY OF THESE TECHNOLOGIES CAN IMPROVE THE RELIABILITY OF THE VULNERABILITY ASSESSMENT EVALUATION RESULTS BY MINIMIZING THE SUBJECTIVE JUDGEMENTS REQUIRED BY THE USER IN PREPARING THE INPUT DATA. THE FINAL REPORT WILL INCLUDE A FUNCTIONAL SPECIFICATION FOR THE DESIGN OF AN "EXPERT VULNERABILITY ASSESSMENT (EVA) SYSTEM".

PDA ENGINEERING
2975 REDHILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
DR JOSEF E WUERER
TITLE:
DUST PARTICLE DISPENSER SYSTEM
TOPIC# 21 OFFICE: AEDC/DOT IDENT#: 28584

A NEED EXISTS TO DEVELOP A RELIABLE AND ACCURATE DEVICE TO METER PARTICLES INTO THE HIGH PRESSURE SECTION OF ARC HEATERS TO SUPPORT THE HIGH TEMPERATURE EROSION TEST CAPABILITIES AT AEDC. SUCH DEVICES ARE NEEDED FOR BOTH THE HEAT - H1 AND DUST EROSION TUNNEL (DET) FACILITIES. THE PRELIMINARY REQUIREMENTS FOR THE METERING DEVICE HAVE BEEN DEVELOPED. THE PROPOSED PHASE I INVESTIGATION CONCENTRATES ON THE PERFORMANCE CHARACTERISTICS OF THREE TYPES OF LABORATORY SCALE PARTICLE METERING DEVICES, SPECIFICALLY: (1) FLUIDIZED BED FEEDERS, (2) MOTOR DRIVEN SCREW FEEDERS, AND (3) ORIFICE METERED PRESSURIZED HOPPERS. IT IS ANTICIPATED THAT THE FINAL DESIGN WILL INCORPORATE COMBINED FEATURES OF THE ABOVE AND POSSIBLY OTHER FEEDER DESIGNS. IT IS PLANNED TO FABRICATE AND EVALUATE IN DETAIL THE PERFORMANCE OF A FULL SCALE PROTOTYPE PARTICLE METERING DEVICE.

PDA ENGINEERING
2975 REDHILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
LIAM GROENER
TITLE:
HIGH TEMPERATURE SURFACE EMISSIVITY MEASUREMENT SYSTEM
TOPIC# 22 OFFICE: AEDC/DOT IDENT#: 28586

SUBMITTED BY

THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP LABORATORY APPARATUS TO MEASURE THE SPECTRAL EMITTANCE OF MATERIAL SAMPLES AT HIGH TEMPERATURES. THE APPARATUS WILL BE CAPABLE OF MAKING THE MEASUREMENTS OVER A RANGE OF FROM 0 TO 10 MICRONS. THE DESIGN GOAL IS TO PERMIT MEASUREMENTS AT SAMPLE TEMPERATURES UP TO 5000 DEGREES R.

PDA ENGINEERING
2975 REDHILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
J R STETSON
TITLE:
REENTRY VEHICLE WINDOW SYSTEM DESIGN OPTIONS
TOPIC# 212 OFFICE: BMO/MYSC IDENT#: 28629

NEW REENTRY VEHICLE CONCEPTS UNDER DEVELOPMENT BY THE AIR FORCE HAVE ANTENNA WINDOW REQUIREMENTS THAT PUSH THE LIMITS OF CURRENT DESIGN TECHNOLOGY. THE OBJECTIVE OF THIS PROGRAM IS TO INVESTIGATE MATERIALS AND DESIGN OPTIONS DEVELOPED TO MEET ADVANCED REENTRY SYSTEM REQUIREMENTS WITHOUT COMPROMISING VEHICLE INTEGRITY OR EFFECTIVENESS. CURRENT AND FUTURE ANTENNA WINDOW SYSTEM REQUIREMENTS WILL BE DEFINED. MATERIAL AND DESIGN CONCEPTS WILL BE SELECTED FOR TRADE-OFF COMPARISONS FOR USE ON SPECIFIED RV SYSTEMS. GROUND TESTS WILL BE DEFINED TO IDENTIFY MATERIAL AND DESIGN REQUIREMENTS FOR CURRENT REENTRY SCENARIOS. AEROTHERMAL AND STRUCTURAL RESPONSE CAPABILITIES WILL BE RECOMMENDED. THIS PROGRAM WILL EMPHASIZE ANTENNA WINDOW DESIGN OPTIONS BASED ON NEW MATERIALS AND NEW DESIGN CONCEPTS USING ADVANCED TEST METHODS AND ANALYTICAL METHOD ENHANCEMENTS.

PERCEPTICS CORP
725 PELLISSIPPI PKWY
KNOXVILLE, TN 37933
CONTRACT NUMBER:
DR R C GONZALEZ
TITLE:
PARALLEL PROCESSING APPLICATIONS FOR AVIONICS
TOPIC# 85 OFFICE: AFWAL/ASD IDENT#: 26909

SUBMITTED BY

A PHASE I PROGRAM IS PROPOSED FOR IDENTIFYING, IMPLEMENTING, AND BENCHMARKING A SET OF ALGORITHMS IN A PARALLEL (HYPERCUBE) COMPUTING ENVIRONMENT. SPECIFICALLY, THE PROGRAM WILL BE FOCUSED ON CLASSES OF ALGORITHMS SELECTED FROM COMPUTER VISION AND IMAGE PROCESSING AS APPLIED TO AVIONICS, SPECIFICALLY THE PROBLEM OF OBJECT REPRESENTATION, PREDICTION, AND MATCHING. ALGORITHMS IN THESE AREAS HAVE EXTENSIVE DATA AND COMPUTATIONAL REQUIREMENTS WHICH MAKE THEM IDEAL CANDIDATES FOR MASSIVELY PARALLEL COMPUTER IMPLEMENTATIONS. THE HYPERCUBE IS QUICKLY BECOMING A DOMINANT ARCHITECTURE IN THE PARALLEL COMPUTING INDUSTRY DUE TO ITS INHERENT RELIABILITY AS WELL AS ITS ECONOMY OF DESIGN AND PRODUCTION. IN ADDITION, THE HYPERCUBE IS SOFTWARE-RECONFIGURABLE INTO OTHER SUPERCOMPUTING ARCHITECTURES SUCH AS RINGS, TREES, AND MESHES. THE CHOICE OF ALGORITHMS AND ARCHITECTURES DESCRIBED IN THIS PROPOSAL ARE VERY STRONG AREAS OF EXPERTISE AT PERCEPTIS CORPORATION AND THE UNIVERSITY OF TENNESSEE. THE PROBABILITY OF SUCCESS OF PHASE I IS HIGH BECAUSE OF THE EXTENSIVE TECHNICAL BACKGROUND OF THE INVESTIGATORS IN THE PROPOSAL, AND ALSO BECAUSE ALL THE HARDWARE AND SOFTWARE TOOLS NEEDED FOR THIS WORK ARE FIRMLY IN PLACE.

PERCEPTICS CORP
302 - W 5400TH S/STE 201
SALT LAKE CITY, UT 84107
CONTRACT NUMBER:
JAMES E YOUNGBERG
TITLE:
CT INTER/INTRA PIXEL MENSURATION AND IMAGING OF NON-DESTRUCTIVE EVALUATION DATA
TOPIC# 172 OFFICE: AFAL IDENT#: 27118

THE DETAILED CHARACTERIZATION OF INTERFACES BETWEEN ESSENTIALLY HOMOGENEOUS MATERIALS IS IMPORTANT FOR CT NDE OF SOLID ROCKET NOZZLES AND RELATED COMPONENTS. SPEED AND IMAGE SIZE LIMITATIONS OF CURRENT CT IMAGING AND IMAGE EVALUATION HARDWARE LEAVE SUCH FEATURES UNDER-RESOLVED. THIS RESULTS IN UNACCEPTABLE AMBIGUITY AT BOTH THE SINGLE-PIXEL AND MULTIPLE-PIXEL LEVELS. THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP ALGORITHMS WHICH UTILIZE A PRIORI INFORMATION ABOUT THE CT SYSTEM AND ABOUT THE OBJECT BEING IMAGED TO

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ACHIEVE SUPER-RESOLVED ESTIMATES OF NOZZLE CT INTERFACE GEOMETRY. IN THIS PHASE I PROJECT, ADAPTATION OF THEORY AND ALGORITHMS DEVELOPED FOR THE MANUAL AND AUTOMATIC DETECTION OF INTERFACE ANOMALIES IN SOLID ROCKET MOTORS WILL BE INVESTIGATED. THE PROJECT WILL INCLUDE (1) AN INITIAL REVIEW OF PERTINENT WORK TO DATE, (2) AN ANALYSIS OF NOZZLE CT DATA MEASURED BY THE ADVANCED ROCKET NOZZLE INSPECTION SYSTEM (ARNIS) TO ASCERTAIN ITS UNIQUE MEASUREMENT SYSTEM CHARACTERISTICS, (3) AN EXAMINATION OF TYPICAL NOZZLE DESIGN TOLERANCES TO VALIDATE ASSUMPTIONS MADE BY THE PROPOSED ANALYSIS ALGORITHMS, (4) DEMONSTRATION OF THESE ALGORITHMS USING BOTH SYNTHETIC AND MEASURED NOZZLE CT DATA, AND (5) A DETAILED PLAN FOR PHASE II FOLLOWUP.

PERIGEE WEST CO
PO BOX 1292
LA JOLLA, CA 92038
CONTRACT NUMBER:
EDWARD J HUJSAK
TITLE:
A SEA-BASED MEDIUM PAYLOAD LOW COST LAUNCH SYSTEM
TOPIC# 164 OFFICE: AFSD IDENT#: 27102

THE PROPOSED STUDY FOCUSES ON DETERMINING TECHNICAL FEASIBILITY AND VERIFYING LOW LIFE CYCLE COST OF SEA-BASED SPACE LAUNCH SYSTEM. THE EFFORT CONCENTRATES ON SEPARATE DEFINITIONS OF AN ADVANCED LAUNCH VEHICLE IN BOTH EXPENDABLE AND REUSABLE FORMS, AND A SEA-BASED LAUNCHER. THE STUDY THEN COMPLETES A SYSTEM INTEGRATION TO VERIFY LAUNCH SYSTEM METHODS AND PROCESSES, LOGISTICS PECULIAR TO A SEA-BASED OPERATION, AND COST ESTIMATES UNDER EXPENDABLE AND REUSABLE MODES OF OPERATION. THE DEFINITION CONCENTRATES ON THE MEDIUM PAYLOAD CLASS VEHICLE WHERE NO NOTEWORTHY OPPORTUNITIES HAVE BEEN IDENTIFIED FOR SIGNIFICANT REDUCTIONS IN LAUNCH COSTS. SPACE TRANSPORTATION TARGETS TO BE EXAMINED INCLUDE LOW EARTH ORBIT, HIGHER EARTH ORBIT, AND EARTH ESCAPE.

PHASEX CORP
287 EMERSON RD
LEXINGTON, MA 02173
CONTRACT NUMBER:
VAL KRUKONIS
TITLE:
EXPLORATORY DEVELOPMENT ON A NEW NITROGUANIDINE RECRYSTALLIZATION PROCESS USING HABIT MODIFIERS
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23281

SUBMITTED BY

THE CURRENT MANUFACTURING PROCESS PRODUCES 100 MICRON NEEDLESHAPED PARTICLES OF NITROGUANIDINE WHICH ARE NOT SATISFACTORY FOR HIGH SOLIDS CONTENT FORMULATIONS; 500 MICRON SIZED SPHERICAL PARTICLES ARE DESIRED. EXPLORATORY DEVELOPMENT OF A NEW PROCESS USING SUPER-CRITICAL FLUIDS IN CONJUNCTION WITH HABIT MODIFIERS IS DESCRIBED. THE CONCEPT IS BASED UPON THE ABILITY OF A SUPERCRITICAL FLUID TO DISSOLVE IN A NITROGUANIDINE SOLUTION CAUSING RECRYSTALLIZATION OF PARTICLES. THE PROCESS HAS BEEN SHOWN IN A PREVIOUS PROGRAM (F08635-87-C-0346) TO BE EFFECTIVE IN PRODUCING A WIDE VARIETY OF SHAPES AND SIZES; HOWEVER, THE COMBINATION OF PARAMETERS THAT COULD PRODUCE 500 MICRON SPHERES WAS NOT DETERMINED. THE OBJECTIVE OF THE PROGRAM ARE: 1. DETERMINE THE RANGE OF PROCESS PARAMETERS THAT WILL RESULT IN THE FORMATION OF 500 MICRON SPHERES OF NITROGUANIDINE USING HABIT MODIFIERS, 2. DELIVER 1 KG OF THE IMPROVED NITROGUANIDINE CRYSTALS FOR EVALUATION, 3. PREPARE A FLOW CHART AND CARRY OUT AN ECONOMIC ASSESSMENT OF THE PROCESS.

PHYSICAL DYNAMICS INC
PO BOX 1883
LA JOLLA, CA 92038
CONTRACT NUMBER: F49620-88-C-0091
WALTER N PODNEY
TITLE:
SUPERCONDUCTIVE DEVICES FOR NONDESTRUCTIVE TESTING
TOPIC# 230 OFFICE: AFOSR/NE IDENT#: 28653

WE PROPOSE TO INITIATE DEVELOPMENT OF THREE NON-CONTACTING SUPER-CONDUCTIVE ELECTROMAGNETIC SYSTEMS FOR NONDESTRUCTIVE TEST AND EVALUATION APPLICATIONS. TWO SYSTEMS USE SQUID GRADIOMETERS AND SUPERCONDUCTIVE MAGNETIZING COILS. ONE IS SUITED TO TESTING FLAT METAL METAL FOILS, SHEETS, OR PLATES. THE OTHER IS DESIGNED FOR TESTING TUBING, PIPES, AND RODS. THE THIRD PROPOSED SYSTEM CONSISTS OF A SINGLE SUPERCONDUCTING COIL. IT IS THE SUPERCONDUCTIVE ANALOG TO CONVENTIONAL EDDY CURRENT FLAW DETECTION SYSTEMS. SUPERCONDUCTIVE SYSTEMS OFFER GREAT IMPROVEMENTS IN SENSITIVITY AND SPATIAL RESOLU-TION OVER CONVENTIONAL MAGNETIC AND ELECTROMAGNETIC NDE SYSTEMS. FURTHERMORE, THEIR UNMATCHED SENSITIVITY AT FREQUENCIES OF A FEW HERTZ EXTEND THE USABLE PENETRATION DEPTH BY NEARLY TWO ORDERS OF

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MAGNITUDE OVER THAT OFFERED BY PRESENT-DAY SYSTEMS. PROTOTYPE SYSTEMS TO BE FABRICATED AND TESTED IN PHASE II WORK USE LIQUID HELIUM TEMPERATURE SUPERCONDUCTORS. NONETHELESS, THE RECENTLY DISCOVERED CLASS OF LIQUID NITROGEN TEMPERATURE SUPERCONDUCTORS OFFERS THE PROMISE OF CONVENIENT AND ECONOMICAL SUPERCONDUCTING NDE SYSTEMS.

PHYSICAL OPTICS CORP
2545 - W 237TH ST
TORRANCE, CA 90505
CONTRACT NUMBER:
DR TOMASZ JANNSON
TITLE:
NIO CONCENTRATORS WITH HIGH DIRECTIONAL RESOLUTIONS
TOPIC# 184 OFFICE: AFWL IDENT#: 27138

PHYSICAL OPTICS CORPORATION (POC), UNDER THE SPONSORSHIP OF DOE, HAS BEGUN DEVELOPMENT OF A FIBER OPTIC COLLIMATOR/CONCENTRATOR THAT HAS THE HIGHEST DIRECTIONAL ALLOWED BY THE LAWS OF PHYSICS (THE 2ND LAW OF THERMODYNAMICS). THE NON-IMAGING OPTICAL CONCENTRATOR HAS NO MOVING PARTS, IS LIGHTWEIGHT AND RADIATION HARD, AND CAN RESOLVE THE DIRECTION OF INCIDENT PHOTONS (VISIBLE AND IR). IN PHASE I OF THIS PROGRAM, POC WILL GATHER TOGETHER A LARGE NUMBER OF THESE SENSORS ATTACHED TO OPTICAL FIBERS IN ORDER TO MAKE A PROTOTYPE MODELED AFTER THE COMPOUND EYE (OMMATIDIUM) OF AN INSECT. THIS OPTICAL SYSTEM TOGETHER WITH SIGNAL PROCESSING WILL THEN BE DESIGNED TO DETECT AND DETERMINE THE POSITION OF LIGHT SOURCES RELATIVE TO THE SENSOR. THE PHASE I PROGRAM WILL CONSIST OF POC PROVIDING A FUNCTIONAL DESCRIPTION OF AN OPTICAL SENSOR BUILT AROUND THIS BASE TECHNOLOGY THAT CAN DETECT AND DETERMINE THE POSITION AND SEPARATION OF POINT LIGHT SOURCES RELATIVE TO THE SENSOR. A PROOF-OF-CONCEPT MODEL WILL BE FABRICATED AND TESTED. A REPORT DEFINING THE REQUIREMENTS OF THIS SENSOR FOR USE ABOARD FUTURE AIR FORCE AIRCRAFT WILL CONCLUDE THIS PHASE, IN PHASE II IT IS PROJECTED THAT THE PROTOTYPE MODEL WILL BE REFINED AND THE SOLID ANGLE OF COVERAGE WILL BE EXPANDED TO 2 pi STERADIANS. IT IS ALSO EXPECTED THAT IN THIS OPTICAL CONFIGURATION REDUNDANCY WILL BE PROVIDED IN THAT ADJUNCT OPTICAL FIBER/DETECTOR UNITS WILL PROVIDE OVERLAPPING COVERAGE WHEN DETECTING AND LOCATING MULTIPLE LIGHT SOURCES.

SUBMITTED BY

PMI - PHOENIX METALLURGICAL INC
PO BOX 12 - 7 AIRPORT DR
HOPEDALE, MA 01747
CONTRACT NUMBER:
JOHN B BERTOLET
TITLE:
ELECTRIC RESISTANCE HEATING AND CONSOLIDATION OF THERMOPLASTIC MATRIX COMPOSITES
TOPIC# 108 OFFICE: AFWAL/ASD IDENT#: 26938

THE OBJECTIVE OF THE PROPOSED DEVELOPMENT PROGRAM IS TO EVALUATE THE FEASIBILITY OF USING ELECTRIC RESISTANCE HEATING OF STRUCTURAL CARBON FIBER IN THE MANUFACTURE OF THERMOPLASTIC MATRIX COMPOSITE PARTS. THE INNOVATIVE TECHNOLOGY PROPOSED HAS THE POTENTIAL TO SIGNIFICANTLY REDUCE FABRICATED COMPOSITE PARTS COST BY REDUCING MANUFACTURING CYCLE TIMES AND ENERGY REQUIREMENTS AND BY MAKING EXISTINC EQUIPMENT SUITABLE FOR THE PROCESSING OF NEW HIGH TEMPERATURE THERMOPLASTIC AND THERMOSET COMPOSITES. THE HEATING OF COMPOSITE COMPONENTS FOR CURE OR CONSOLIDATION USING ELECTRIC RESISTANCE HEATING OF THE CARBON FIBER WITHIN THE LAYUP IS POTENTIALLY MORE EFFICIENT THAN CURRENT HEATING METHODS BECAUSE CARBON DIBER IS WELL SUITED FOR RESISTIVE HEATING AND THE HEAT CAN BE CONFINED TO THE PART ONLY RATHER THAN TO THE PART, THE TOOL, AND THE PRESS OR AUTOCLAVE. THE TASKS PROPOSED INCLUDE DEVELOPMENT OF CONTROL TECHNIQUES, EVALUATION OF TEMPERATURE UNIFORMITY AND REPEATABILITY, OPTIMIZATION OF PROCESS PARAMETERS FOR THE CONSOLIDATION OF HIGH QUALITY THERMOPLASTIC MATRIX COMPOSITE LAMINATES, AND DETERMINATION OF BASIC MECHANICAL PROPERTIES OF THE LAMINATES CONSOLIDATED. IT IS ANTICIPATED THAT AT THE END OF PHASE I A NEW MANUFACTURING TECHNOLOGY WITH SIGNIFICANT COST ADVANTAGES OVER CURRENT TECHNOLOGIES WILL HAVE BEEN DEMONSTRATED.

POLYTRONIX INC
805 ALPHA DR
RICHARDSON, TX 75081
CONTRACT NUMBER:
JACOB W LIN
TITLE:
THIN FILM COATINGS FOR INFRARED DETECTORS
TOPIC# 168 OFFICE: AFSTC IDENT#: 27110

SUBMITTED BY

THE METHOD OF PLASMA ASSISTED CHEMICAL VAPOR DEPOSITION (PACVD) WILL BE EMPLOYED TO DEPOSIT QUARTER WAVELENGTH FILMS ON LONG WAVELENGTH IR DETECTORS (E.G., InSb). THE TECHNIQUE EMPLOYED HAS BEEN SHOWN TO PRODUCE FILMS OF TUNABLE REFRACTIVE INDEX (FROM 1.3 TO 2.3) AND THESE FILMS ARE KNOWN TO HAVE FAVORABLE PTICAL TRANSMISSION PROPERTIES. THESE FILMS WILL ENHANCE IR DETECTOR SENSITIVITY BY ACTING AS ANTI-REFLECTIVE COATINGS. A NUMBER OF MONOMERS WILL BE TESTED UNDER VARYING PLASMA DISCHARGE CONDITIONS TO PRODUCE THE DESIRED FILMS. IN PARTICULAR, AMORPHOUS C:H ILMS OBTAINED FROM PLASMA POLYMERIZATION OF HYDROCARBONS APPEAR MOST PROMISING. THE FILMS OBTAINED WILL BE EVALUATED IN TERMS OF THEIR REFRACTIVE INDICES, OPTICAL (UV-VISIBLE AND IR) PROPERTIES AND TEMPERATURE STABILITIES, INCLUDING CYCLING BETWEEN ROOM TEMPERATURE AND 10K. IN PRINCIPLE, THE METHODOLOGY PROPOSED IS IDEALLY SUITED FOR FUTURE DEVELOPMENT AS MULTILAYERED INTERFERENCE DEVICES. THIS WOULD INVOLVES SIMPLE THE SEQUENTIAL DEPOSITION OF FILMS USING DIFFERENT MONOMERS.

PROGRESSIVE LEARNING SYSTEMS
11325 SEVEN LOCKS RD - STE 226
POTOMAC, MD 20854
CONTRACT NUMBER:
MICHAEL D BASS
TITLE:
DEVELOPMENT OF AN INTELLIGENT INSTRUCTIONAL DESIGN SYSTEM
TOPIC# 63 OFFICE: AFHRL/HSD IDENT#: 26866

WE PROPOSE THE DEVELOPMENT OF A COMPUTER-BASED INTELLIGENT INSTRUCTIONAL DESIGN SYSTEM (IIDS) THAT WILL ACT AS AN ADVISOR TO THE INSTRUCTIONAL DESIGNER CONCERNING EDUCATIONAL THEORY AND PRINCIPLES. THE IIDS WILL BE BASED ON CONTEMPORARY COGNITIVE AND INSTRUCTIONAL SCIENCE PRINCIPLES AND WILL TAKE ADVANTAGE OF CURRENT TECHNOLOGIES WITHIN THE FIELD OF ARTIFICIAL INTELLIGENCE. THE IIDS WILL BE A STRUCTURED ENVIRONMENT THAT REQUIRES THE DEVELOPER TO MAP OR CHART THE KEY STEPS OF INSTRUCTION. IT WILL HAVE AN INTERACTIVE EXPERT KNOWLEDGE SYSTEM CONTAINING FUNDAMENTAL KNOWLEDGE ABOUT INSTRUCTION AND TRAINING. THIS KNOWLEDGE SYSTEM WILL MONITOR THE USER PRODUCED INSTRUCTIONAL OUTLINE AND GIVE ADVISE ON HOW TO IMPROVE THE OUTLINE OR BE AVAILABLE FOR DIRECT QUERY FROM THE USER CONCERNING INSTRUC-

SUBMITTED BY

TIONAL PRINCIPLES.

PSI TECHNOLOGY CO
PO BOX 3100 - RESEARCH PK
ANDOVER, MA 01810
CONTRACT NUMBER:
DAVID HAM
TITLE:
ADDITIVES FOR NOx EMISSIONS CONTROL FROM FIXED SOURCES
TOPIC# 62 OFFICE: AFESC/RDXP IDENT#: 23246

SEVERAL EXHAUST GAS NO(x) ABATEMENT PROCESSES EXIST BASED ON HETEROGENEOUS REACTION OF A REDUCED NITROGEN CONTAINING ADDITIVES SUCH AS NH(3). NONE OF THESE EXISTING PROCESSES CAN BE USED IN ITS PRESENT FORM TO MEET PROPOSED NO(x) EMISSIONS REGULATIONS ON JET TEST STATIONS AND INCINERATORS. WE PROPOSE TO TEST COMBINATIONS OF ADDITIVES AND CATALYSTS THAT HAVE THE POTENTIAL TO LEAD TO A NEW PROCESS OF THE SELECTIVE CATALYTIC REDUCTION (SCR) TYPE THAT CAN FILL THIS NEED. IN COMMERCIALLY AVAILABLE SCR PROCESSES ALMOST HALF OF THE REVENUE REQUIRED IS FOR THE COST OF CATALYST REPLACEMENT. BY USING A MORE REACTIVE ADDITIVE WE ANTICIPATE THAT A SIMPLER AND THEREFORE LONGER LIVED, LESS EXPENSIVE CATALYST CAN BE USED TO PROVIDE A PREFERRED PROCESS. OUR PROPOSED PHASE I PROJECT CONSISTS OF FIXED BED ADDITIVE/CATALYST SCREENING TESTS AND SUBSEQUENT ENTRAINED FLOW TESTS OF PROMISING CANDIDATE COMBINATIONS. THE DATA ACQUIRED FROM THESE TESTS WILL ESTABLISH THE FEASIBILITY OF OUR APPROACH AND PROVIDE NECESSARY DATA FOR THE DESIGN OF A BENCH SCALE PROTOTYPE IN A PHASE II PROGRAM.

PSI TECHNOLOGY CO
PO BOX 3100 - RESEARCH PK
ANDOVER, MA 01810
CONTRACT NUMBER:
STEPHEN A JOHNSON
TITLE:
REBURNING FOR CONTROLLING NOx AND HYDROCARBON EMISSIONS FROM INCINERATORS AND JET ENGINE TEST CELLS
TOPIC# 62 OFFICE: AFESC/RDXP IDENT#: 23247

SUBMITTED BY

THE U.S. AIR FORCE OPERATES JET ENGINE TEST CELLS AND WASTE INCINERATORS THAT MAY EMIT SIGNIFICANT AMOUNTS OF NITROGEN OXIDES. COMBUSTION MODIFICATIONS THAT ARE COMMONLY USED TO CONTROL NO(x) EMISSIONS FROM BOILERS ARE NOT PRACTICAL FOR TEST ENGINES OR INCINERATORS BECAUSE HIGH TEMPERATURES AND RAPID FUEL-AIR MIXING ARE REQUIRED TO MAXIMIZE ENGINE PERFORMANCE AND DESTRUCTION OF HAZARDOUS WASTES. MOST POST-COMBUSTION NO(x) CONTROL TECHNIQUES, HOWEVER, TEND TO BE VERY EXPENSIVE TO BUILD AND OPERATE. THE PSI TECHNOLOGY COMPANY (PSIT) HAS CONSIDERABLE EXPERIENCE IN THE DEVELOPMENT OF BOTH COMBUSTION AND POST-COMBUSTION NO(x)-RELATED TECHNOLOGIES. HEREIN, WE PROPOSE A TECHNICAL AND ECONIMIC FEASIBILITY STUDY TO ASSESS A TECHNOLOGY KNOWN AS "REBURNING", WHEREBY NO(x) IS DESTROYED BY HYDROCARBON RADICALS PRODUCED IN A SECONDARY FLAME ZONE DECOUPLED FROM THE EMISSION SOURCE. THE POTENTIAL ADVANTAGES OF REBURNING INCLUDE LOW CAPITAL INVESTMENT, 50 TO 80 PERCENT NO(x) REDUCTION, HEAT RECOVERY FROM THE PROCESS, AND DESTRUCTION OF HYDROCARBONS, SOOT, OR DIOXIN PRECURSORS ESCAPING THE PRIMARY COMBUSTION ZONE. OUR APPROACH IS TO PERFORM TWO SITE-SPECIFIC REBURNING SYSTEM DESIGNS, SUPPORTED BY LIMITED PROOF-OF-CONCEPT TESTS IN AN EXISTING PSIT COMBUSTION FACILITY IN ORDER TO DUPLICATE THE FLUE GAS TEMPERATURE, NO(x), AND O(2) CONCENTRATIONS IN THE INCINERATOR/JET ENGINE EXHAUST. THE RESULTS OF THIS ANALYSIS WOULD LEAD TO PROCESS OPTIMIZATION TESTS AND DETAILED SYSTEM DESIGNS IN PHASE II.

QUALCOMM INC
10555 SORRENTO VALLEY RD
SAN DIEGO, CA 92121
CONTRACT NUMBER:
KLEIN S GILHOUSEN
TITLE:
COMBINED DATA LINK/POSITION LOCATION SUBSYSTEMS FOR AUTOMATED TACTICAL AIRCRAFT LAUNCH AND RECOVERY SYSTEMS (ATALARS)
TOPIC# 29 OFFICE: ESD/XRB IDENT#: 28470

QUALCOMM, INC. PROPOSES TO INVESTIGATE THE USE OF A DATA LINK INTEGRATED WITH A GPS POSITION LOCATION SYSTEM, BEING DEVELOPED FOR A TEST AND TRAINING RANGE APPLICATION, IN THE ATALARS APPLICATION. SHOWN THROUGH THIS EFFORT WILL BE ATALARS' ABILITY TO PROVIDE GPS

SUBMITTED BY

DERVIED POSITION REPORTS FROM A LARGE NUMBER OF AIRCRAFT OPERATING IN A TACTICAL ENVIRONMENT TO A CENTRAL ATC CONTROL POINT. THE DATA LINK ALSO PROVIDES MEANS FOR TRANSMITTING ATC INSTRUCTIONS TO AIR-CRAFT. THE PROPOSED PROGRAM WILL MODIFY DATA LINK AND GPS SUBSYSTEMS NOW BEING DEVELOPED FOR AIRBORNE USE OF AF TEST RANGES TO MEET ATALARS' NEED FOR WIDE BAND FREQUENCY HOPPING ANTI-JAM PROTECTION; MEASURE THE COMBINED ANTI-JAM AND EXPECTED PERFORMANCE; AND PREPARE A DRAFT TYPE A SPECIFICATION FOR USE IN A FIELD TEST THAT COULD BE PERFORMED IN A FOLLOW-ON SBIR PHASE II EFFORT.

QUALCOMM INC
10555 SORRENTO VALLEY RD
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR ANDREW J VITERBI
TITLE:
RESEARCH IN MATHEMATICS AND COMPUTER SCIENCE: CALCULATION OF THE PROBABILITY OF UNDETECTED ERROR FOR CERTAIN ERROR DETECTION CODES
TOPIC# 239 OFFICE: AFOSR/NM IDENT#: 28656

BINARY CYCLIC REDUNDANCY CHECK CODES, KNOWN AS CRC CODES, ARE UTILIZED AS MESSAGE ERROR DETECTION CODES IN APPLICATIONS REQUIRING VERY HIGH CONFIDENCE THAT A MESSAGE IS RECEIVED ERROR FREE. OFTEN, IT IS ASSUMED THAT THE PROBABILITY OF UNDETECTED ERROR FOR THESE CODES IS UPPER BOUNDED BY 2(-r), WHERE r IS THE NUMBER OF REDUNDANT (PARITY) BITS. THIS UPPER BOUND IS NOT CORRECT FOR MANY CODES, HOWEVER, ESPECIALLY SHORTENED CYCLIC CODES. WE HAVE FOUND A NEW METHOD FOR DETERMINING AN EXACT EVALUATION OF THE PROBABILITY OF UNDETECTED ERROR FOR THE MOST COMMONLY UTILIZED CODES. WE PROPOSE TO INVESTIGATE HOW THIS METHOD CAN BE UTILIZED TO PRODUCE THE VERY BEST MESSAGE ERROR DETECTION CODES.

QUAN-SCAN INC
77 N OAK KNOLL AVE - #114
PASADENA, CA 91101
CONTRACT NUMBER:
DR PAUL E WEST
TITLE:
STRUCTURE VIBRATION CONTROLLER BASED ON SCANNING TUNNELING MICROSCOPE TECHNOLOGY
TOPIC# 169 OFFICE: AFAL IDENT#: 27114

SUBMITTED BY

THE AIR FORCE SEEKS ADVANCED DEVICES, ALGORITHMS, AND SYSTEMS FOR CONTROLLING STRUCTURES IN SPACE. THE EMERGING TECHNOLOGY OF SCANNING TUNNELING MICROSCOPY (STM) IS CAPABLE OF IMAGING SURFACES TO ATOMIC RESOLUTION IN AMBIENT ATMOSPHERE. QUAN-SCAN PROPOSES TO STUDY THE FEASIBILITY OF DEVELOPING A HIGHLY SENSITIVE VIBRATION CONTROLLER BASED ON STM TECHNOLOGY AND PIEZOCERAMICS FOR SPACE STRUCTURES. STM-BASED VIBRATION SENSORS AND CONTROLLERS ARE EXPECTED TO EXHIBIT HIGH SENSITIVITY, LARGE DYNAMIC RANGE, A FREQUENCY RESPONSE FROM DC TO SEVERAL HUNDRED kHz, AND THEY PROMISE TO BE SMALLER, MORE COMPACT, MORE RUGGED, LESS POWER CONSUMING, AND LESS COSTLY THAN EXISTING SYSTEMS.

QUANTIC INDUSTRIES INC
990 COMMERCIAL ST
SAN CARLOS, CA 94070
CONTRACT NUMBER:
KENNETH C KITLAS
TITLE:
ADVANCED ANTI-ARMOR FUZE SYSTEM
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23282

AN ALL-ELECTRONIC, ANTI-ARMOR WARHEAD FUZE DESIGN AND DEVELOPMENT PROGRAM IS PROPOSED. THE BASIC COMPONENTS OF THE FUZE ARE: (1) A DIODE LASER PROXIMITY SENSOR THAT UTILIZES A SINGLE OPTICAL PATH AND COHERENT DETECTION SCHEME THAT HAS THE POTENTIAL FOR ANGLE-OF-OBLIQUITY DATA DERIVATION, AND (2) AN ELECTRONIC SAFE-ARM DEVICE WITH MULTI-WARHEAD INTERVAL TIMER, AND (3) EXPLODING FOIL INITIATOR FIRE SETS TO INITIATE MULTIPLE WARHEADS AT PRECISE TIMES DETERMINED BY THE FUZE SYSTEM. QUANTIC, WITH SUPPORT FROM DIGITAL SIGNAL CORPORATION (A SMALL BUSINESS), HAS BUILT BRASSBOARDS OF ALL THREE SUBSYSTEMS. THE PROPOSED PHASE I EFFORT WOULD PERFORM DESIGN TRADE STUDIES TO DETERMINE A COST-EFFECTIVE ARCHITECTURE THAT SOLVES THE AIR FORCE PROBLEM. THE MAJOR PRODUCT OF PHASE I IS A LEVEL I DRAWING PACKAGE FOR A PHASE II HARDWARE IMPLEMENTATION THAT ACHIEVES AIR FORCE ANTI-ARMOR FUZE PERFORMANCE OBJECTIVES.

RADIUS ENGINEERING & TOOLING INC
3474 - S 2300RD E
SALT LAKE CITY, UT 84109
CONTRACT NUMBER:
DIMITRIJE MILOVICH
TITLE:
LOW COST RESIN TRANSFER MOLDING OF HIGH PERFORMANCE COMPOSITE COMPONENTS
TOPIC# 141 OFFICE: AFWAL/ASD IDENT#: 26985

SUBMITTED BY

THIS PROJECT IS TO DEVELOP INNOVATIVE TOOLING AND PROCESSING TECHNOLOGY FOR HIGH RATE, LOW COST MANUFACTURE OF HIGH PERFORMANCE COMPOSITE AIRCRAFT STRUCTURAL COMPONENTS USING THE RESIN TRANSFER MOLDING PROCESS. THE CONVENTIONAL RESIN TRANSFER MOLDING PROCESS WILL BE MODIFIED TO FABRICATE COMPONENTS USING HIGH TEMPERATURE RESINS AND GRAPHITE FIBER REINFORCEMENT AT HIGH FIBER VOLUMES. THE APPROACH WILL CONCENTRATE ON MAKING IMPROVEMENTS IN THE TOOLING, RESIN IMPREGNATION SYSTEM, AND THE PROCESS CONTROL AND SEQUENCING. A PROPRIETARY TOOLING TECHNOLOGY IS PROPOSED TO REDUCE TOOLING COST RELATIVE TO CONVENTIONAL TOOLING. THE TOOLING WILL ALLOW THE CAVITY GEOMETRY TO VARY DURING THE PROCESS AND WILL CONTAIN OTHER FEATURES TO CONTROL RESIN FLOW DURING THE IMPREGNATION AND THE SUBSEQUENT DEBULKING AND COMPACTION. THE APPROACH RELIES ON THE MUCH HIGHER PERMEABILITIES PRESENT AT LOWER FIBER VOLUMES AND IN FLOW OUTSIDE THE FIBER BED. TWO TOOLS WILL BE CONSTRUCTED TO DEVELOP THE PROCESS AND FABRICATE COMPONENTS. A TWO-DIMENSIONAL MOLD WILL BE USED TO FABRICATE FLAT PLATES WHICH WILL BE PHYSICALLY AND STRUCTURALLY TESTED FOR BASIC CHARACTERIZATION OF THE PROCESS. A THREE DIMENSIONAL MOLD WILL BE USED FOR FABRICATION OF A TYPICAL AIRCRAFT STRUCTURAL SUCH AS A "T" STIFFENER ON A PLATE WHICH WILL BE PHYSICALLY TESTED.

RESHET INC
314 - N 32ND ST
PHILADELPHIA, PA 19104
CONTRACT NUMBER:
DR JAMES EILBERT
TITLE:
REAL-TIME IMAGE PROCESSING AND IMAGE UNDERSTANDING USING A COMBIN NEURAL NETWORK/EXPERT SYSTEM
TOPIC# 52 OFFICE: RADC/XPX IDENT#: 28580

THIS PROPOSAL IS MOTIVATED BY THE COMPLEMENTARY CAPABILITIES OF EXPERT SYSTEM AND NEURAL NETWORK (NN) TECHNOLOGIES, AND BY THE POTENTIAL FOR A COMBINED SYSTEM TO PERFORM MORE EFFECTIVELY THAN EITHER ALONE. THE LOCAL, BOTTOM-UP APPROACH TO VISION CANNOT DEAL WITH THE NOISE AND THE ON-GOING PRODUCTION OF NOVELTY IN REAL VISUAL SCENES, WHILE EXPERT SYSTEM APPROACHES ARE TOO BRITTLE AND SLOW TO DO REAL-TIME IMAGE PROCESSING. WE BELIEVE THE COMBINED NN/EXPERT

SUBMITTED BY

SYSTEM ARCHITECTURE IN THIS PROPOSAL WILL OVERCOME MANY OF THE PROBLEMS WITH PREVIOUS APPROACHES. THE PROPOSED PROJECT HAS 2 PRIMARY GOALS: 1) TO CONSTRUCT A COMPUTER APPLICATION THAT COMBINES A NEURAL NETWORK (NN) COMPONENT AND AN EXPERT SYSTEM COMPONENT IN A WAY THAT ENHANCES THE PERFORMANCE OF EACH; 2) USE THE SYSTEM TO CREATE FASTER MORE FLEXIBLE SOLUTIONS TO EXPERT LEVEL PROBLEMS IN VISION.

RESOURCE TECHNOLOGIES GROUP INC
400 MISSISSIPPI ST
MORGANTOWN, WV 26505
CONTRACT NUMBER:
DR GEORGE D CASE
TITLE:
AMPLIFYING NERVE AGENT DETECTOR
TOPIC# 63 OFFICE: SAM/HSD IDENT#: 26871

DEVELOPMENT OF AN AMPLIFYING CHEMICAL AGENT DETECTOR, INCORPORATING A MODULAR APPROACH TO SENSING OF NERVE AGENTS AND OTHER CHEMICALS OF MILITARY INTEREST, IS PROPOSED. THE THREE MODULES: (1) A DYNAMIC TRIGGER WHICH RESPONDS TO THE CHEMICAL AGENT OF INTEREST; (2) A BIOAMPLIFIER WHICH CONTAINS THE CENTRAL SWITCH AND WHICH PROVIDES AN INITIAL AMPLIFICATION STAGE; AND (3) AN ELECTROCHEMICAL TRANSDUCER WHICH CONVERTS THE BIOCHEMICAL REACTION PRODUCTS INTO AN ELECTRONIC OUTPUT; CONSTITUE THE STUDY SYSTEM. THE PROPOSED PHASE I RESEARCH SEEKS TO DEMONSTRATE THE CAPABILITY OF THE DYNAMIC TRIGGER MODULE TO DRIVE THE ACTION OF THE BIOAMPLIFIER (FOR WHICH PROOF-OF-CONCEPT HAS BEEN PREVIOUSLY SHOWN), AND THE CAPABILITY OF THE ELECTROCHEMICAL MODULE TO GENERATE AN OUTPUT. SUBSEQUENT R&D (PHASE II) SEEKS TO INTEGRATE THESE MODULES INTO A SELF-CONTAINED WORKING PROTOTYPE DEVICE WHICH CAN BE EVALUATED IN LABORATORY OR FIELD SITUATIONS.

RISK & INDUSTRIAL SAFETY CONSULTANTS INC
292 HOWARD ST
DES PLAINES, IL 60018
CONTRACT NUMBER:
C K KRISHNAKUMAR
TITLE:
LOW BACK PRESSURE NOZZLE
TOPIC# 56 OFFICE: AFESC/RDXP IDENT#: 23192

SUBMITTED BY

HIGH-PRESSURE, LARGE DIAMETER WATER NOZZLES USED FOR FIGHTING FIRES CANNOT BE OPERATED SAFELY OR EFFICIENTLY BY INDIVIDUAL FIREFIGHTERS. THIS PROPOSAL DESCRIBES AN INNOVATIVE NOZZLE DESIGN THAT IS EXPECTED TO LOWER THE NOZZLE REACTION FORCES BY 20-30% WITH AN ATTENDANT REDUCTION IN THROW RANGE OF LESS THAN 5%. A LABORATORY TEST PROGRAM TO VERIFY CONCEPT FEASIBILITY WILL BE FOLLOWED BY PROTOTYPE CONSTRUCTION AND FIELD TESTING. THE NEW DESIGN CALLS FOR THE INSERTION OF A FLOW MODIFIER IN THE FLOW FIELD WITHIN THE NOZZLE BODY. THE FORCES GENERATED BY THE FLOW MODIFIER WILL OPPOSE THE NOZZLE REACTION FORCES AND RESULT IN A NET REDUCTION OF THE AXIAL FORCE AT THE NOZZLE GRIP, WITH A CORRESPONDING, BUT RELATIVELY MUCH SMALLER, PENALTY IN NOZZLE EXIT PRESSURE DROP AND THROW RANGE. IN PHASE II, THE FLOW MODIFIER WILL BE OPTIMIZED TO PROVIDE MAXIMUM REDUCTION OF THE NOZZLE REACTION FORCE AND A MINUMUM LOSS IN NOZZLE FIREFIGHTING PERFORMANCE.

ROTARY POSITIVE MOTORS INC
3431 - 11TH AVE SW
SEATTLE, WA 98134
CONTRACT NUMBER:
MEREDITH E BOWDISH SR
TITLE:
EFFICIENT FANS AND BLOWERS
TOPIC# 213 OFFICE: BMO/MYSC IDENT#: 28630

THE STATED OBJECTIVE OF TOPIC NUMBER AF88-213 IS TO "INVESTIGATE AND RECOMMEND NEW BLOWER DESIGNS TO INCREASE AIR FLOW AT LOWER POWER REQUIREMENTS." A GOAL OF GREATER THAN 80% EFFICIENCY IS ESTABLISHED. THE STATEMENT THAT "SEVERAL MODULES SHOULD BE CAPABLE OF VENTILATING AN UNDERGROUND SPACE OF 30 MILLION CUBIC FEET AT DEPTHS UP TO 6000 FEET" WOULD INVOLVE BLOWERS CAPABLE OF PRESSURE IN THE TEN TO TWENTY POUND PER SQUARE INCH RANGE AND A TOTAL AIR FLOW (BY SEVERAL MODULES) OF AS HIGH AS 500,000 CUBIC FEET PER MINUTE. WE WILL RECOMMEND AN ENTIRELY NEW DESIGN WHICH HAS BEEN UNDER DEVELOPMENT BY OUR GROUP FOR SEVERAL YEARS. THE DESIGN COMBINES THE BEST FEATURES OF POSITIVE DISPLACEMENT (VOLUME REDUCTION) AND DYNAMIC (VELOCITY PRESSURE) IN SUCH A WAY THAT ADIABATIC EFFICIENCY HIGHER THAN 85% HAS ALREADY BEEN ACHIEVED IN A PROTOTYPE OF APPROXIMATELY 350 C.F.M. AT PRESSURES FROM 5 PSIG TO 35 PSIG. THE DESIGN LENDS ITSELF TO VERY LARGE MACHINES OF

SUBMITTED BY

SEVERAL THOUSAND CUBIC FEET AIR CAPACITY AND AT STILL HIGHER EFFICIENCY DUE TO THE SCALE EFFECT. THE OPTIMUM SPEED OF LARGE UNITS WOULD FAVOR DIRECT DRIVE BY LARGE DIESEL ENGINES OR ELECTRIC MOTORS.

S M SYSTEMS & RESEARCH CORP
8401 CORPORATE DR - STE 510
LANDOVER, MD 20785
CONTRACT NUMBER:
DR Y V SOMAYAJULU
TITLE:
CODE-FREE DUAL-FREQUENCY CPS RECEIVER DESIGN
TOPIC# 178 OFFICE: AFGL IDENT#: 27127

THE GLOBAL POSITIONING SYSTEM (GPS) SATELLITES TRANSMIT INFORMATION ON TWO FREQUENCIES IN THE L-BAND: L(1) AT 1575.42 MHz AND L(2) AT 1227.6 MHz. THESE TWO TRANSMISSIONS ARE PHASE-COHERENT SINCE THEY ARE DERIVED FROM A COMMON OSCILLATOR. BOTH OF THESE FREQUENCIES ARE MODULATED BY A P-CODE CONSISTING OF PSEUDO-RADOM ONE'S AND ZERO'S. THE TRANSMISSION RATE IS 10.23 MHz AND THE CODE ON BOTH THE TRANS-MISSIONS IS COHERENT. THE IMPORTANCE OF GPC SATELLITES FOR IONO-SPHERIC RESEARCH IS IN THE DUAL COHERENTLY TRANSMITTED FREQUENCIES DESIGNED FOR THE NAVIGATION USER TO CORRECT FOR IONOSPHERIC ERRORS. SINCE THE P-CODE HAS LIMITED ACCESSIBILITY, IT IS PROPOSED TO ANALYZE AND OPTIMIZE TWO SIMPLER RECEIVER DESIGNS WHICH DO NOT REQUIRE THE KNOWLEDGE OF THE P-CODE. ONE SYSTEM IS MORE ACCURATE BUT REQUIRES SOMEWHAT COMPLEX CIRCUITRY TO DETERMINE THE DIFFERENTIAL GROUP DELAY. THE SECOND SYSTEM PROPOSED IS MUCH SIMPLER AND CHEAPER TO IMPLEMENT BUT OF ADEQUATE ACCURACY TO DETERMINE THE DIFFERENTIAL GROUP DELAY TO CALIBRATE THE DIFFERENTIAL CARRIER PHASE FOR ABSOLUTE VALUE OF ELECTRON CONTENT. IN BOTH SYSTEMS, THE DIFFERENTIAL CARRIER PHASE AND SIGNAL AMPLITUDES ARE ALSO MEASURED. THE PARAMETERS PROVIDE NECESSARY INFORMATION ON IONOSPHERIC IRREGULARITIES AND DISTURBANCES.

SANDIA RESEARCH ASSOCS INC
PO BOX 2545
CORRALES, NM 87048
CONTRACT NUMBER:
DR STEVEN M SHOPE
TITLE:
CHARACTERIZATION AND EFFECTIVENESS MODEL OF A SEISMIC IMITATOR
TOPIC# 229 OFFICE: BMO/MYSC IDENT#: 28643

SUBMITTED BY

THIS PROPOSAL DESCRIBES AN SBIR PROJECT TO DEFINE AND CHARACTERIZE A SEISMIC SIGNAL GENERATOR THAT CAN BE USED TO IMITATE THE SEISMIC SIGNALS CREATED BY AN UNDERGROUND TUNNEL BORING MACHINE (TBM). IT HAS BEEN SUGGESTED THAT A SEISMIC IMITATOR CAN BE USED TO MASK THE OPERATION OF A TBM AS WELL AS INTERFERE WITH ANY LOCATION ATTEMPTS THAT COULD NULLIFY THE STRATEGIC BENEFIT OF AN UNDERGROUND FACILITY. THE MAIN OBJECTIVE OF THIS RESEARCH IS TO ACCURATELY DEFINE A TBM SOURCE MODEL AND TO USE THIS MODEL TO DEFINE THE CHARACTERISTICS OF A SEISMIC IMITATOR. THE EFFECTIVENESS OF THE SEISMIC IMITATOR WILL BE DETERMINED BY ITS ABILITY TO MASK DETECTION AND PREVENT OR DISTURB A TBM LOCATION ATTEMPT. PHASE I IS DIVIDED INTO FOUR TASKS. TASK ONE DEVELOPS A SOFTWARE MODEL OF THE SEISMIC EMISSIONS FROM A TBM. THE MODEL WILL BE VALIDATED BY COMPARISON AND ACTUAL TBM FIELD DATA FROM PREVIOUS MEASUREMENTS. TASK TWO WILL INVESTIGATE CANDIDATE DEVICES WHICH COULD FUNCTION AS SEISMIC IMITATORS. TASK THREE STUDIES THE PROBLEM OF USING A SEISMIC IMITATOR TO MASK SIGNAL DETECTION. THE FINAL TASK, TASK FOUR, INVESTIGATES THE INTERFERING EFFECTS A SEISMIC IMITATOR WOULD HAVE ON A TBM LOCATION PROCEDURE.

SANITECH INC
1935 - E AURORA RD
TWINSBURG, OH 44087
CONTRACT NUMBER:
SIDNEY G NELSON
TITLE:
APPLICATION OF A NEW SORBENT FOR CONTROL OF SO2 AND NOx EMISSIONS FROM EXISTING AIR FORCE FIXED SOURCES
TOPIC# 62 OFFICE: AFESC/RDXP IDENT#: 23248

SANITECH ENGINEERS HAVE DEVELOPED A NEW CLASS OF SORBENTS THAT VERY EFFECTIVELY REMOVES SO2 AND NOx FROM GASES EXHAUSTED FROM EXISTING FIXED SOURCES. THE NEW SORBENTS ARE A COMPOSITE MATERIAL, CONSISTING OF A LOW-COST MINERAL OXIDE, MgO OR CaO, BONDED TO AND REACTED WITH A LOW-COST EXPANDED SILICATE CARRIER, VERMICULITE OR PERLITE. THE MATERIALS POSSESS SOME VERY UNIQUE AND DESIRABLE PROPERTIES. THEIR VERY LARGE SURFACE AREAS PERMIT HIGH OXIDE LOADINGS, AND THE MATERIALS APPEAR TO BE CATALYTIC AND SUPER-REACTIVE. THEY ARE RELATIVELY STRONG, CAN BE USED DRY OR MOIST, AND PERFORM WELL AT

SUBMITTED BY

TYPICAL PRE-STACK GAS TEMPERATURES. IMPORTANTLY, CERTAIN COMPOSITIONS ARE READILY REGENERABLE AT LOW TEMPERATURE BY HEATING ALONE. TYPICALLY, THE SORBENTS REMOVE 99% OF THE SO2, 90-PLUS % REMOVAL OF THE NO APPEARS POSSIBLE. AN OPTIMUM METHOD OF USING THE NEW SORBENT IS NEEDED. THE PROPOSED RESEARCH INVOLVES ATTEMPTING TO DEVELOP SUCH A METHOD. USE OF THE SORBENT AS A SIMPLE INJECTION INTO THE FLUE GAS DUCT WILL BE INVESTIGATED. THE PROPOSED RESEARCH WILL ALSO INCLUDE AN EVALUATION OF THE NOVEL PROCESS MODIFICATION TO ENHANCE NO REMOVAL.

SCHWARTZ ELECTRO-OPTICS INC
3404 N ORANGE BLOSSOM TRAIL
ORLANDO, FL 32804
CONTRACT NUMBER:
ROBERT L GUSTAVSON
TITLE:
LASER IMAGING RADAR SYSTEM
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23288

THE INTENSITY, INTENSITY-GRADIENT, RANGE, AND RANGE GRADIENT MEASUREMENT CAPABILITIES OF LASER IMAGING RADAR SYSTEMS SHOULD PERMIT THE DETECTION, RECOGNITION, AND IDENTIFICATION OF VIRTUALLY ANY TUPE OF TARGET IF THERE IS AN ADEQUATE SIGNAL-TO-NOISE RATIO. SCHWARTZ ELECTRO-OPTICS PROPOSES TO DEVELOP A COMPACT, HIGH-PERFORMANCE DIODE-LASER-BASED IMAGING RADAR SYSTEM SUITABLE AS A TARGET DISCRIMINATION SENSOR FOR SMART SUBMUNITIONS. THE KEY TECHNICAL OBJECTIVE OF THE EFFORT WILL BE OPTIMIZATION OF THE LASER-DIODE TRANSMITTER AND RECEIVER IN ORDER TO MAXIMIZE SIGNAL-TO-NOISE. ENHANCING THE SYSTEM SIGNAL-TO-NOISE RATIO BY MEANS OF NARROW OPTICAL BANDWIDTH OPERATION WILL BE EXPLORED. THIS WILL INVOLVE INJECTION LOCKING A PULSED DIODE LASER TO A CW LASER TO REDUCE THE 45 A LASER LINEWIDTH SO THAT IT IS COMPATIBLE WITH A 5 TO 10 A RECEIVER FILTER.

SCIENCE & ENGINEERING ASSOCS INC
PO BOX 3722
ALBUQUERQUE, NM 87190
CONTRACT NUMBER:
DR BRIAN G STEPHAN
TITLE:
NEW AND INNOVATIVE CONCEPTS FOR AERONAUTICAL SYSTEMS (MEASURES OF EFFECTIVENESS FOR AIRBORNE STRATEGIC RELOCATABLE TARGETS)
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 27003

SUBMITTED BY

THE PERFORMANCE OF ANY "INNOVATIVE SENSORS" FOR SRT APPLICATIONS MUST BE QUANTIFIED AND COMPARED WITH EACH OTHER AND WITH CURRENT STATE-OF-THE-ART SENSORS. THEY MUST ALSO BE PLACED IN CONTEXT WITH THE BENEFITS/COSTS OF IMPROVED SRT PERFORMANCE DUE TO AREA LIMITATION TECHNIQUES, OPTIMIZED SEARCH/ROUTE PLANNING, ALTITUDE/VISIBILITY/SURVIVABILITY CONSTRAINTS, ETC. THIS PROPOSED PHASE I SBIR WOULD DEVELOP A SET OF STRAIGHT-FORWARD MEASURES OF EFFECTIVENESS FOR VARIOUS SENSORS, FOCUSING ON PROBABILITY OF DETECTION AS FUNCTION OF SLANT RANGE, UNDER A VARIETY OF CONDITIONS. THESE MOEs WOULD THEN BE INTEGRATED INTO A BROADER MACROSCOPIC VIEW OF PROBABILITY OF ENGAGEMENT (Pe), CURRENTLY UNDER DEVELOPMENT FOR DNA AND STRATEGIC AIR COMMAND.

SCIENCE & ENGINEERING ASSOCS INC
PO BOX 3722
ALBUQUERQUE, NM 87190
CONTRACT NUMBER:
DR EUGENE W SKLUZACEK
TITLE:
NEW CONCEPTS AND INNOVATIONS FOR LOGISTICS SUPPORT (LOGISTICS SUPPORT PLANNING FOR HYPERSONIC VEHICLES)
TOPIC# 147 OFFICE: AFWAL/ASD IDENT#: 27007

THIS EFFORT WOULD SCOPE THE LOGISTICS PLANNING EFFORTS REQUIRED FOR THE AIR FORCE TO SUPPORT AN ENTIRELY NEW CLASS OF HYPERSONIC VEHICLES, EFFORTS FROM BASE PLANNING TO OPERATIONAL MAINTENANCE SUPPORT. A MATRIX OF PROBABLE WORLD SETTINGS AND MISSION SCENARIOS WOULD SERVE AS A STARTING POINT TO IDENTIFY FIRST-ORDER FLIGHT SYSTEM MISSION REQUIREMENTS, SYSTEM REQUIREMENTS AND ASSOCIATED GROUND SUPPORT REQUIREMENTS. THE LATTER AREA WOULD THEN BE EXPANDED IN A STANDARD WORK BREAKDOWN STRUCTURE FORMAT TO IDENTIFY MAJOR LOGISTICS REQUIREMENTS. APPROPRIATE USAF AND NASA DOCUMENTATION WOULD BE REVIEWED TO ENSURE THAT ALL MAJOR LOGISTICS ELEMENTS ARE INCLUDED. PHASE II WOULD THEN EXAMINE EACH OF THE NEW LOGISTICS NEEDS CREATED BY THIS CLASS OF VEHICLES AND IDENTIFY THE NECESSARY PLANNING, ACQUISITION AND TRAINING ACTIVITIES REQUIRED TO IMPLEMENT THESE NEEDS.

SCIENCE & ENGINEERING ASSOCS INC
6301 INDIAN SCHOOL RD NE
ALBUQUERQUE, NM 87110
CONTRACT NUMBER:
DR ROBERT KOSLOVER
TITLE:
USER-ORIENTED MICROWAVE COUPLING SIMULATION CODE UTILIZING CAD-BASED EXPERT SYSTEM ONN IBM PC-AT COMPATIBLES
TOPIC# 183 OFFICE: AFWL/PRC IDENT#: 27135

SUBMITTED BY

MICROWAVE COUPLING SIMUATION CODES (MCCs) ARE REQUIRED FOR MODELING SUSCEPTIBILITY OF MILITARY SYSTEMS TO HIGH POWER MICROWAVES (HPM). MCCs ASSIST IN DETECTION OF SYSTEM WEAKNESSES TO HPM AND IN EVALUATING PROPOSED HPM-HARDENING TECHNOLOGY. THE RAPIDLY INCREASING NEED TO ESTABLISH SYSTEM SUSCEPTIBILITIES TO HPM MANDATES DEVELOPMENT AND DISTRIBUTIONN OF MCC SOFTWARE WHICH MAY BE OPERATED BY SYSTEM-LEVEL ANALYSTS. GEMACS, AVERSATILE MCC, IS NOW AVAILABLE ON PC-AT COMPATIBLES. PC-GEMACS IS PRESENTLY AVAILABLE WITH A GRAPHICS-BASED, CAD/CAM-TYPE INPUT-OUTPUT PACKAGE CAPABLE OF READING A VARIETY OF DATA FORMATS AND CAD STRUCTURAL/ELECTRICAL FILES. HOWEVER, AS WITH OTHER MCCs,PROPER OPERATION AND INTERPRETATION OF OUTPUT DATA ARE PRESENTLY ACCESSIBLE ONLY TO THOSE HIGHLY EXPERIENCED IN MICROWAVE COUPLING AND NUMERICAL ANALYSIS. THIS INNOVATIVE RESEARCH WILL EXAMINE THE FEASIBILITY OF DEVELOPMENT, AND REQUIREMENTS FOR IMPLEMENTATION OF A KNOWLEDGE-BASED EXPERT SYSTEM ATTACHED TO PC-GEMACE. SEA IS HIGHLY EXPERIENCED IN USER-ORIENTED OPERATING SYSTEMS. SEA WILL BE ASSISTED BY DR. E. L. COFFEY, KEY DEVELOPER OF GEMACS. DEVELOPMENT AND DISTRIBUTION OF THIS SOFTWARE SHOULD ALLOW SYSTEM-LEVEL ANALYSTS TO OPERATE PC-GEMACS CORRECTLY AND CONFIDENTLY, MEETING PRESENT AND FUTURE COMPUTATIONAL DEMANDS.

SCIENCE & ENGINEERING ASSOCS INC
PO BOX 3722
ALBUQUERQUE, NM 87190
CONTRACT NUMBER:
W PRESTON GEREN
TITLE:
RETRODIRECTIVE ANTENNA BARRAGE JAMMER
TOPIC# 197 OFFICE: BMO/MYSC IDENT#: 28612

SEA WILL DEVISE A JAMMER CONCEPT THAT WILL JAM THREAT RADARS OVER THEIR ENTIRE OPERATING FREQUENCY. THE CONCEPTUAL JAMMER WILL SURVIVE REENTRY AND OPERATE THROUGHOUT THE ENDO-ATMOSPHERE. THE PRINCIPAL ELEMENT OF THE DESIGN IS A RETRODIRECTIVE LINEAR ARRAY WITH HIGH-GAIN AMPLIFIERS WHICH WILL RECEIVE THE THREAT RADAR SIGNAL, AMPLIFY AND/OR PROCESS IT, AND REDIRECT A JAMMING SIGNAL BACK TO THE THREAT RECEIVER. AMPLIFICATION POWER WILL BE SUPPLIED BY A BATTERY PACK CONTAINED WITHIN THE VEHICLE. THE MAJOR ADVANTAGE OF THE RETRO-

SUBMITTED BY

DIRECTIVE ARRAY IS THAT THE ANTENNA MAIN LOBE IS DIRECTED AT THE THREAT RECEIVER, WHICH ENHANCES JAMMING EFFICIENCY. THE FOCUS OF THIS EFFORT WILL BE TO DETERMINE THE ANTENNA PERFORMANCE, BATTERY POWER, SIGNAL PROCESSOR, AND REENTRY VEHICLE DESIGN REQUIREMENTS FOR AN EFFECTIVE JAMMER, BASED UPON THE THREAT RADAR SPECIFICATIONS, THE PERTINENT ENGAGEMENT SCENARIOS, AND THE WEIGHT AND SIZE CONSTRAINTS. THE FINAL REPORT WILL PRESENT THE FEASIBILITY OF THE JAMMER CONCEPT, AREAS OF TECHNICAL RISK, AND A DESCRIPTION OF THE DESIGN.

SCIENCE & TECHNOLOGY ASSOCS INC
1700 N MOORE ST - STE 1920
ARLINGTON, VA 22209
CONTRACT NUMBER:
JOHN E DRAIM
TITLE:
MINIMUM SATELLITE CONSTELLATIONS FOR REDUNDANT EARTH COVERAGE
TOPIC# 165 OFFICE: AFSD IDENT#: 27104

IT IS PROPOSED THAT STA CONDUCT ADVANCED RESEARCH ON A CLASS OF SLIGHTLY TO MODERATELY ELLIPTIC HIGH ALTITUDE SATELLITE CONSTELLATIONS WHICH EXHIBIT EARTH COVERAGE STATISTICS SUPERIOR TO CONVENTIONAL CONSTELLATIONS WHICH EMPLOY MAINLY GEOSTATIONARY OR GEOSYNCHRONOUS, CIRCULAR ORBIT SATELLITES. THIS CLASS OF CONSTELLATION HAS ALREADY BEEN SHOWN BY THE PRINCIPAL INVESTIGATOR TO BE CAPABLE OF PROVIDING CONTINUOUS SINGLE HEMISPHERIC, SINGLE GLOBAL, AND DOUBLE GLOBAL EARTH COVERAGE WITH THREE, FOUR, AND SIX SATELLITE ARRAYS RESPECTIVELY. EACH ARRAY REPRESENTS A DECREASE IN NUMBERS OF SATELLITES REQUIRED OVER ANY PREVIOUSLY KNOWN ARRAYS. THE PROPOSED EFFORT WOULD EXTEND EARLIER WORK INTO THE AREA OF TRIPLE AND QUADRUPLE COVERAGE WITH THE MINIMUM NUMBERS OF SATELLITES. THE OUTPUT OF THIS EFFORT WILL BE AS FOLLOWS: a) A DESCRIPTION OF THE DESIGN METHODOLOGY AND TECHNIQUES USED BY THE PRINCIPAL INVESTIGATOR. b) STATEMENTS OF THEOREMS AND COROLLARIES DEVELOPED FOR REDUNDANT CONTINUOUS COVERAGE ARRAYS. c) EPHEMERIDES, OR ORBITAL PARAMETERS, FOR OPTIMAL ARRAY CONFIGURATIONS, IN TABULAR FORM. d) LIMITING VALUES ON INPUT ORBITAL PARAMETERS. THIS WILL CONSIST OF CONTOURS OR LIMIT LINES OUTSIDE WHICH THE COVERAGE CRITERIA CANNOT BE MET.

SCIENTECH INC
PO BOX 3129
TEMPE, AZ 85281
CONTRACT NUMBER:
P K SINHA
TITLE:
GROWTH OF GALLIUM ARSENIDE EPITAXIAL FILMS BY INDIRECT PLASMA ENHANCED LOW PRESSURE METAL ORGANIC CHEMICAL VAPOR DEPOSITION
TOPIC# 88 OFFICE: AFWAL/ASD IDENT#: 26911

SUBMITTED BY

THIS PROPOSAL IS AIMED AT TESTING THE FEASIBILITY OF A NEW AND INNOVATIVE IDEA FOR THE PRODUCTION OF LAYERED SEMICONDUCTOR DEVICE STRUCTURES, SUCH AS GALLIUM ARSENIDE-GALLIUM ALUMINUM ARSENIDE. THE EPITAXIAL GROWTH WILL BE DONE BY THE PROCESS OF INDIRECT PLASMA ENHANCED LOW PRESSURE METAL ORGANIX CHEMICAL VAPOR DEPOSITION UNDER THE INFLUENCE OF A MAGNETIC FIELD APPLIED TO THE GROWING LAYER. IT IS EXPECTED THAT HIGH QUALITY LAYERS WITH UNIFORM PROPERTIES OVER A LARGE AREA CAN BE GROWN AT TEMPERATURES CONSIDERABLY LOWER THAN HAS BEEN POSSIBLE SO FAR. THE INDIRECT BREAKDOWN OF THE PLASMA WILL RESULT IN A SIGNIFICANT DECREASE IN THE DEFECT DENSITY OF THE GROWN LAYERS. THE APPLICATION OF THE MAGNETIC FIELD TO THE SUBSTRATE AND THE GROWING LAYER IS EXPECTED TO ENABLE THE GROWTH OF HIGHLY PERFECT CRYSTALLINE LAYERS AT CONSIDERABLY LOWER GROWTH TEMPERATURES THAN HAS BEEN POSSIBLE SO FAR.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058 - 50 NYE RD
GLASTONBURY, CT 06033
CONTRACT NUMBER: F49620-88-C-0108
HAROLD L GRUBIN
TITLE:
NUMERICAL MODELING OF TWO-TERMINAL QUANTUM WELL DEVICES
TOPIC# 236 OFFICE: AFOSR/NE IDENT#: 28655

THIS DOCUMENT DISCUSSES A PROPOSAL TO PERFORM NUMERICAL SIMULATIONS OF TWO-DIMENSIONAL QUANTUM WELL DEVICES. NUMERICAL SIMULATIONS ARE TO BE PERFORMED THROUGH IMPLEMENTATION OF SCIENTIFIC RESEARCH ASSOCIATES' ALGORITHMS TO SOLVE THE QUANTUM TRANSPORT AND POISSON EQUATIONS. BOTH SINGLE AND DOUBLE WELL RESONANT TUNNELING STRUCTURES ARE CONSIDERED. THERE ARE SEVERAL ISSUES ADDRESSED IN THE PROPOSAL. THE FIRST IS TAILORING THE DEVICE PARAMETERS SUCH AS THE BARRIER WIDTH AND HEIGHT TO OPTIMIZE THE PERFORMANCE OF TWO-TERMINAL QUANTUM WELL DEVICES. THUS, THE CURRENT VOLTAGE CHARACTERISTICS ARE EXAMINED FOR SINGLE AND DOUBLE WELL DIODES. ADDITIONALLY, THE TUNNELING TIMES OF THE CARRIERS ARE OBTAINED.

SCIFERS T INC
111 N SEPULVEDA BLVD - STE 330
MANHATTAN BEACH, CA 90266
CONTRACT NUMBER:
DR L V (JOE) SCIFERS
TITLE:
INNOVATIVE CONCEPTS TO REDUCE SPACE SYSTEMS COST
TOPIC# 165 OFFICE: AFSD IDENT#: 27105

SUBMITTED BY

ONE OF THE MAJOR CONTRIBUTING FACTORS TO HISTORICALLY HIGH SATELLITE COST HAS BEEN THE REQUIREMENT FOR VERY HIGH RELIABILITY. THESE HIGH COSTS ARE INHERENT IN ALL CURRENT COST ESTIMATING RELATIONSHIPS THAT ARE BASED ON PRIOR EXPERIENCE. REASONABLE RELIABILITY REQUIREMENTS FOR CONSTELLATIONS OF MODERATELY LARGE NUMBERS OF SATELLITES MAY BE QUITE DIFFERENT THAN FOR CONSTELLATIONS OF VERY FEW SATELLITES. OUR ANALYSIS SUGGESTS THAT MODERATE RELAXATION OF RELIABILITY LEVELS CAN SIGNIFICANTLY REDUCE SATELLITE COST WITHOUT AFFECTING MISSION PERFORMANCE. THE PURPOSE OF OUR PROPOSED RESEARCH IS TO IDENTIFY REASONABLE SPACE SYSTEM RELIABILITY GOALS THAT RESULT IN LARGE SAVINGS WITHOUT SACRIFICE OF MISSION PERFORMANCE.

SEB ENGINEERING INC (FSCM63834)
1230 EAGAN INDUSTRIAL RD - STE 101
EAGAN, MN 55121
CONTRACT NUMBER:
DR T KRAUTHAMMER
TITLE:
REACTIVE PROTECTION FOR HARDENED FACILITIES
TOPIC# 58 OFFICE: AFESC/RDXP IDENT#: 23217

THE PURPOSE OF THE PROPOSED RESEARCH IS TO EXPLORE THE WORTHINESS OF EMPLOYING REACTIVE PROTECTION FOR STRUCTURES SUBJECTED TO THE EFFECTS OF MODERN CONVENTIONAL WEAPONS. THE REACTIVE PROTECTION CONSISTS OF HIGH EXPLOSIVE (HE) CHARGES EMBEDDED IN PROTECTIVE LAYERS. THE SYSTEM IS INTENDED FOR DISTRUBING THE PENETRATION CAPABILITIES OF MODERN CONVENTIONAL WEAPONS, CONTROLLING THE MAGNITUDE OF LOADS ON THE STRUCTURE, AND/OR REDUCING THE EFFECTS OF SHOCK WAVES TO AN ACCEPTABLE LEVEL. MOST INERT OR PASSIVE PROTECTION CONCEPTS SUFFER FROM SEVERE LIMITATIONS. MAINLY, THEY ARE INCAPABLE OF ADAPTING TO CHANGING CIRCUMSTANCES SUCH AS NEW WEAPON SYSTEMS, AND/OR NEW COMBAT OPERATIONAL ENVIRONMENTS FOR WHICH THEY WERE NOT DESIGNED. IT HAS BEEN KNOWN THAT THE COST OF UPGRADING PASSIVE DEFENSE SYSTEMS IS USUALLY VERY HIGH, AND THEREFORE, IT COULD BE MORE EFFECTIVE TO EXPLORE THE DEVELOPMENT AND IMPLEMENTATION OF NOVEL HARDENING CONCEPTS.

SEMCOR INC
815 E GATE DR
MOUNT LAUREL, NJ 08054
CONTRACT NUMBER:
DONALD H NELSON
TITLE:
DESIGN FOR PRODUCIBILITY GUIDELINES FOR ELECTRONIC SYSTEMS
TOPIC# 34 OFFICE: ESD/XRB IDENT#: 28602

SUBMITTED BY

THE OBJECTIVE OF THIS EFFORT IS TO CONDUCT RESEARCH WHICH WILL LEAD TO THE DEVELOPMENT OF PRODUCIBILITY GUIDELINES THAT CAN BE APPLIED DURING THE DESIGN PHASE OF ELECTRONIC SYSTEMS. THE GUIDELINES ADDRESS PRODUCIBILITY FEATURES OF ELECTRONIC SYSTEMS AT LEVELS RANGING FROM BASE MATERIALS TO AUTOMATED ASSEMBLY, WHILE CONSIDERING OTHER RELATED PRODUCT ASPECTS, SUCH AS, MAINTAINABILITY, TEST, AND INSPECTION. THE PROJECT WILL BE PERFORMED OVER A TWENTY-SIX WEEK PERIOD AND WILL BE PERFORMED BY HIGHLY QUALIFIED INDIVIDUALS FAMILIAR WITH THE ELECTRONIC SYSTEM PRODUCIBILITY ISSUES OF BOTH GOVERNMENT AND INDUSTRY.

SEMCOR INC
815 E GAST DR
MOUNT LAUREL, NJ 08054
CONTRACT NUMBER:
DONALD H NELSON
TITLE:
DESIGN PRODUCIBILITY ASSESSMENT
TOPIC# 221 OFFICE: BMO/MYSC IDENT#: 28638

THE OBJECTIVE OF THIS EFFORT IS TO DEVELOP A SET OF STANDARDS THAT CAN BE USED TO ASSESS THE PRODUCIBILITY OF A GIVEN DESIGN WHILE IT IS STILL IN THE CONCEPT STAGE. THEY WILL PERMIT THE AIR FORCE TO EXAMINE A GIVEN DESIGN CONCEPT AND, BY UNDERSTANDING THE PERFORMANCE REQUIREMENTS, THE PROCESSES AVAILABLE TO MANUFACTURE THE ITEM, THE MATERIALS REQUIRED, AND LABOR SKILLS INVOLVED, TO PRODUCE AN INDEX OR MEASURE OF PRODUCIBILITY. THEY WILL BE FLEXIBLE ENOUGH TO ASSESS CONCEPTS RANGING FROM ELECTRONICS AND PRECISION INSTRUMENTS TO SHEET METAL AND SOLID PROPULSION MOTORS. THE STANDARDS WILL BE DOCUMENTED IN A FORM SIMILAR TO MILITARY STANDARDS. THE PROJECT WILL TAKE 26 WEEKS AND BE CARRIED OUT BY INDIVIDUALS FAMILIAR WITH PRODUCIBILITY ISSUES OF BOTH GOVERNMENT AND INDUSTRY.

SENSIS CORP
THE MARKETPLACE - RT 92
MANLIUS, NY 13104
CONTRACT NUMBER:
ROBERT W SCHARSTEIN
TITLE:
NEARFIELD ADAPTIVE ARRAY MEASUREMENTS
TOPIC# 44 OFFICE: RADC/XPX IDENT#: 28570

SUBMITTED BY

IN ORDER TO DETERMINE THE FAR-FIELD PROPERTIES OF AN ADAPTIVE ARRAY ANTENNA SEVERAL NEAR-FIELD MEASUREMENT TECHNIQUES TOGETHER WITH AN ANALYTICAL MAPPING OR EXTRAPOLATION ARE PROPOSED AND ANALYZED WITH RESPECT TO ACCURACY AND ANECHOIC CHAMBER IMPLEMENTATION LOGISTICS. STEADY STATE PERFORMANCE INCLUDING GEOMETRY SENSITIVITY AND RADIATION PATTERN EFFECTS SUCH AS NULL DEPTH, NULL WIDTH, SIDELOBE LEVEL, AND MAIN BEAM DEGRADATION AS WELL AS THE TRANSIENT ADAPTATION TIME OF THE ADAPTIVE ALGORITHM ARE MEASURED. THE PROPOSED DESIGN AND ANALYSIS ADDRESSES FULLY ADAPTIVE ARRAYS AND PARTIALLY ADAPTIVE SYSTEMS OF SIDELOBE CANCELLERS. THE NEAR-FIELD ELECTROMAGNETIC INTERACTION BETWEEN THE SIGNAL SOURCE, WIDE-BAND JAMMER SOURCES, AND TEST ARRAY IS EXACTLY AMENABLE TO A LINEAR MATHEMATICAL MODEL. THE CROSS-CORRELATION BETWEEN ELMENTS IS CALCULATED USING A COMBINATION OF INTEGRAL TRANSFORMS AND RANDOM SIGNAL METHODS, TOGETHER WITH CLASSICAL ELECTROMAGNETIC MODELS SUCH AS THE PLANE WAVE SPECTRUM TO REPRESENT THE NEAR FIELDS. HOWEVER, THE ADAPTIVE PROCESSOR COMPONENT OF THE ADAPTIVE ARRAY SYSTEM IS TYPICALLY NON-LINEAR, WHICH IMPLIES THAT THE ANALYTICAL MAPPING FOR NEAR-FIELD TO FAR-FIELD PERFORMANCE IS GENERALLY SYSTEM DEPENDENT.

SENSORS HAWAII INC
2540 DOLE ST - RM 448
HONOLULU, HI 96822
CONTRACT NUMBER:
GORDON P LEE
TITLE:
A NOVEL MULTI-DIMENSION RESOLVING ACCELEROMETER FOR GUIDED PROJECTILE APPLICATIONS
TOPIC# 15 OFFICE: AD/PMR IDENT#: 23396

THE NOVEL MULTI-DIMENSION RESOLVING ACCELEROMETER IS A UNIQUE INERTIAL MEASURING DEVICE DESIGNED TO PROVIDE CARTESIAN COMPONENTS OF APPLIED ACCELERATION. THE DEVICE OPERATION IS AN INNOVATIVE UTILIZATION OF SEMICONDUCTOR TECHNOLOGY COUPLED WITH STRUCTURAL MECHANICS. THE OBJECTIVES OF THIS PROPOSAL IS TO CONTINUE THE DEVELOPMENT OF THE NOVEL MULTI-DIMENSION RESOLVING ACCELEROMETER, AND TO STUDY THE FEASIBILITY OF THIS DEVICE FOR GUIDED PROJECTILE APPLICATIONS. THE MONOLITHIC CHARACTER OF THE NOVEL MULTI-

SUBMITTED BY

DIMENSION RESOLVING ACCELEROMETER IS A TREMENDOUS ADVANTAGE OVER CURRENT COMMERCIALLY AVAILABLE NON-MONOLITHIC DEVICES. THE COMPACT SIZE OFFERED BY THIS LOW PROFILE DEVICE MAY OFFER SIGNIFICANT IMPROVEMENTS IN SPACE AND WEIGHT REQUIREMENTS OF MOTION SENSING SYSTEMS. IN ADDITION, EASE OF FABRICATION, LOW COSTS, AND HIGH RELIABILITY MAY BE EXPECTED FROM SUCH MONOLITHIC DEVICES.

SIMONS J C & ASSOCS
206 CONANT RD
WESTON, MA 02193
CONTRACT NUMBER:
JOHN C SIMONS
TITLE:
METAL COATING OF GLASS FIBERS
TOPIC# 205 OFFICE: BMO/MYSC IDENT#: 28616

DEVELOPMENT OF THE DESIGN OF AN ECONOMIC PRODUCTION METHOD FOR COATING LONG LENGTHS OF 1 MIL GLASS FIBER WITH ALUMINUM IS PROPOSED, TOGETHER WITH AN EVALUATION OF FEASIBILITY OF THE DESIGN CONCEPT. TARGET VOLUME IS 12 MILES/DAY, WITH MINIMUM RUNS AT LEAST 1 MILE. EXISTING COATING TECHNOLOGIES WILL BE ANALYZED, CAPABILITIES FOR MEETING THE AF REQUIREMENTS DETERMINED, AND MODIFIED DESIGNS DEVELOPED AS REQUIRED. ADVANTAGES OF MULTIPLE FIBER SYSTEMS WILL BE EXAMINED AND COMPARED. SPOOLING AND TRANSPORT MECHANISMS ARE RECOGNIZED AS CRITICAL TO CONTINUITY OF PRODUCTION AND WILL BE GIVEN DETAILED ATTENTION. CLEANING PROCEDURES WILL BE CAREFULLY EVALUATED. TRADEOFF STUDIES WILL BE MADE, AN OPTIMAL SYSTEM CONFIGURATION DEVELOPED, AND FEASIBILITY OF ECONOMIC MANUFACTURE DETERMINED. ACHIEVEMENT OF THE ECONOMIC MANUFACTURING OBJECTIVE BY REASONABLE ADAPTATION AND EXTENSION OF EXISTING TECHNOLOGY WITH A HIGH PROBABILITY OF SUCCESS IS CONSIDERED REALISTIC. THE RESULTS OF DESIGN ANALYSES AND TRADEOFF STUDIES WILL BE REPORTED WITH A RECOMMENDED SYSTEM CONCEPT, PROPOSED HARDWARE SPECIFICATIONS, AND A PLAN FOR DEMONSTRATIONG PROOF OF CONCEPT BY SMALL SCALE PRODUCTION IN A FOLLOW-ON PHASE II PROJECT.

SIMULA INC
10016 - S 51ST ST
PHOENIX, AZ 85044
CONTRACT NUMBER:
JOSEPH W COLTMAN
TITLE:
FEASIBILITY OF REDUCING THE INCIDENCE OF LOW BACK PAIN IN HELICOP PILOTS USING A CONTOURED AND VIBRATION-ATTENUATING CUSHION
TOPIC# 63 OFFICE: AAMRL/HSD IDENT#: 26862

SUBMITTED BY

CHRONIC LOWER BACK PAIN IN HELICOPTER PILOTS IS A SIGNIFICANT PROBLEM. THE TASK OF CONTROLLING A HELICOPTER, WHETHER IT IS HOVERING OR MOVING STRATEGICALLY IN FLIGHT IS PHYSICALLY TAXING. PILOTS ARE SUBJECTED TO EXTREMELY UNCOMFORTABLE SEATING POSITIONS ASSOCIATED WITH CONTROLLING THE AIRCRAFT AND SEVERE HELICOPTER VIBRATIONS, CAUSING MANY PILOTS TO SUFFER FROM CHRONIC LOW BACK PAIN. THE INCIDENCE OF BACKACHE IN HELICOPTER PILOTS IS MORE SEVERE THAN IN PILOTS OF OTHER AIRCRAFT. THE HIGH INCIDENCE OF PILOT LOW BACK PAIN IS DIRECTLY RELATED TO DECREASED PERFORMANCE IN FLIGHT AND INCREASED HEALTH AND MEDICAL COSTS. THIS PROGRAM WILL IDENTIFY WAYS TO REDUCE OR ELIMINATE THE AILMENT BY DETERMINING THE EFFECT OF CUSHIONS, DESIGNED WITH ERGONOMIC CONTOURS AND FABRICATED WITH VIBRATION-ABSORBING MATERIALS, ON THE INCIDENCE OF LOW BACK PAIN. IN EVALUATING THE PERFORMANCE OF THESE CUSHIONS, VIBRATION TRANSMISSIBILITY AND LOW BACK COMFORT WILL BE THE TWO CRITERIA EXAMINED. IN THE PROPOSED PHASE I EFFORT, SIMULA WILL EXAMINE THE CONTRIBUTING PROBLEMS (I.E. POSTURE AND VIBRATION) AND THEN EXAMINE CUSHION CONCEPTS WITH THE POTENTIAL OF REDUCING THE EFFECTS OF THESE FACTORS. IN PHASE II, THE SELECTED CUSHION(S) WILL BE INSTALLED IN A HELICOPTER FOR THE SOLE PURPOSE OF DETERMINING ITS EFFECT ON LOW BACK PAIN.

SOFTWARE PRODUCTIVITY SOLUTIONS INC
PO BOX 361697
MELBOURNE, FL 32936
CONTRACT NUMBER:
DR J KAYE GRAU
TITLE:
KNOWLEDGE-BASED LANGUAGE SENSITIVE QUALITY EDITOR
TOPIC# 36 OFFICE: RADC/XPX IDENT#: 28561

IN ORDER TO SUPPORT BUILDING QUALITY INTO SOFTWARE AS IT IS DEVELOPED, SPS PROPOSES TO DEVELOP A LANGUAGE SENSITIVE QUALITY EDITOR (LSQE). THE LSQE WILL PROVIDE IMMEDIATE QUALITY FEEDBACK TO THE ENGINEER DEVELOPING THE SOFTWARE. SYNTAX AND SEMANTIC KNOWLEDGE OF THE DEVELOPMENT LANGUAGE WILL ALSO BE AVAILABLE IN AN UNOBTRUSIVE MANNER. IN PHASE I, REQUIREMENTS AND TOP-LEVEL ARCHITECTURE FOR THE LSQE WILL BE DEVELOPED, A KNOWLEDGE-BASE WILL BE DESIGNED AND AN APPROACH FOR INTEGRATING LSQE INTO SOFTWARE

SUBMITTED BY

LIFE CYCLE SUPPORT ENVIRONMENT (SLCSE) WILL BE CREATED.

SPACE POWER INC
1977 CONCOURSE DR
SAN JOSE, CA 95131
CONTRACT NUMBER:
J KENT KOESTER
TITLE:
DIRECT SIMULATION OF HYPERSONIC VEHICLE FLOWS
TOPIC# 103 OFFICE: AFWAL/ASD IDENT#: 26931

A COMPARATIVE STUDY OF HIGH INTERACTION HYPERSONIC FLOWS IN THE TRANSITION REGION IS PROPOSED. IDEALIZED AXISYMMETRIC AND PLANAR CONFIGURATIONS WILL BE INVESTIGATED OVER A WIDE RANGE OF FREESTREAM CONDITIONS FROM NEAR-CONTINUUM TO FREE MOLECULAR. OUR DIRECT SIMULATION MONTE CARLO CODE WILL BE USED FOR COMPUTING THESE HIGHLY NON-EQUILIBRIUM FLOWS WITH EMBEDDED SHOCK WAVE STRUCTURES. THIS IN-HOUSE CODE ALLOWS FOR MULTICOMPONENT, REACTING SPECIES, NONEQUILIBRIUM MOLECULAR MODELS, AND VARIETY OF BOUNDING SURFACES BOTH SOLID AS WELL AS FLUID. A SERIES OF SIMULATION RUNS WILL BE COMPUTED SO THAT A PARAMETRIC STUDY CAN BE MADE OF FREESTREAM CONDITIONS AND MOLECULAR MODEL DATA. EXISTING DATA FOR HYPERSONIC VEHICLES OPERATING AT VERY HIGH ALTITUDES WILL BE REVIEWED AND COMPARED WITH THE RESULTS OF BOTH SIMULATION RUNS AS WELL AS AVAILABLE CONTINUUM THEORY RESULTS. NEW EXPERIMENTS NEEDED FOR MODEL COMPARISON AND CODE ENHANCEMENTS REQUIRED FOR DESIGN APPLICATIONS WILL BE DELINEATED.

SPACE QUALIFIED SYSTEMS CORP
3400 INTERNATIONAL DR NW - STE 2J
WASHINGTON, DC 20008
CONTRACT NUMBER: F19628-88-C-0105
CLIFFORD B VINES
TITLE:
AUTOMATED AIR TRAFFIC CONTROL SYSTEM CONCEPTS
TOPIC# 29 OFFICE: ESD/XRB IDENT#: 28474

THE U.S. AIR FORCE AND OTHER DEFENSE ELEMENTS HAVE RECOGNIZED THE

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NEED TO SOLVE THE PROBLEM OF THE LACK OF SURVIVABILITY OF CURRENT AIR TRAFFIC MANAGMENT CAPABILITIES IN A CONVENTIONAL WAR. TACTICAL AIR TRAFFIC CONTROL (ATC) SYSTEMS MUST ENSURE THE SAFE MOVEMENT OF AIRCRAFT USING PASSIVE IDENTIFICATION AND DATA LINK EXCHANGES. THIS WILL REQUIRE THE DEVELOPMENT OF INTERNATIONAL COORDINATION AND COMPATIBLE HARDWARE INTERFACES WHICH MUST FULLY CONSIDER INTEROPERABILITY OF THE INTERSERVICE AND INTERNATIONAL COMMAND AND CONTROL SYSTEMS INVOLVED. CURRENTLY UNDER REVIEW BY USAF IS A CONCEPT DEFINITION PROGRAM FOR A SURVIVABLE PASSIVE ATC AND AIRSPACE MANAGEMENT SYSTEM. THIS PASSIVE ATC AND AIRSPACE MANAGEMENT EQUIPMENT MUST BE READILY COMPATIBLE WITH SURVIVING CIVIL AIR TRAFFIC CONTROL SYSTEMS AND INTERFACE WITH NATO AND ALLIED FORCED C(3) TACTICAL HARDWARE PROTOCOLS AND MESSAGE FORMATS. THE INTERFACES FOR NATO COMPABIBILITY WILL BE IDENTIFIED INCLUDING THE OPERATIONAL COMMAND AUTHORITIES AND THE COMMAND AND CONTROL SYSTEMS TO BE INTEGRATED. FURTHER, BY DEVELOPING THE HARDWARE INTERFACE DESIGN CRITERIA, THIS EFFORT WILL PROVIDE THE RESEARCH FOR RAPID HARDWARE INTEGRATION OF THE PASSIVE ATC AND AIRSPACE MANAGEMENT SYSTEM WITH THE EXISTING BATTLEFRONT COMMAND, CONTROL AND COMMUNICATION SYSTEMS.

SPARTA INC
23041 DE LA CARLOTA - STE 400
LAGUNA HILLS, CA 92653
CONTRACT NUMBER:
MORENO WHITE
TITLE:
COMPOSITE MATERIALS FOR MANIKIN SKELETAL COMPONENTS
TOPIC# 63 OFFICE: AAMRL/HSD IDENT#: 26863

THE STRUCTURAL SKELETAL COMPONENTS USED IN MODERN TEST MANIKIN DO NOT PROVIDE ADEQUATE BIOFIDELIC INERTIAL OR DEFORMATION RESPONSE. THIS PHASE I SBIR EFFORT WILL ESTABLISH THE FEASIBILITY OF USING COMPOSITE MATERIALS TO OBTAIN A MORE HUMAN-LIKE RESPONSE IN LONG BONE SKELETAL COMPONENTS OF TEST DUMMIES. THE MAIN QUESTIONS TO BE ANSWERED THROUGH THIS PHASE I EFFORT ARE: 1) WHAT ARE THE INERTIAL AND DEFORMATION LONG BONE (FEMUR AND HUMERUS) CHARACTERISTICS? 2) WHAT COMPOSITE CONSTITUENTS, WEAVE, AND PROCESSING REQUIREMENTS ARE NECESSARY TO SIMULATE THESE LONG BONE CHARACTERISTICS: AND 3) WHAT ARE THE MANUFACTURING AND COST CONCERNS ASSOCIATED WITH USING COM-

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POSITE MATERIALS TO SIMULATE HUMAN LONG BONE CHARACTERISTICS IN HIGH PERFORMANCE TEST MANIKINS? THE PROGRAM APPROACH WILL BE TO OBTAIN AND ANALYZE LONG BONE DATA, SURVEY CANDIDATE COMPOSITE CONSTITUENT MATERIALS AND SELECT POTENTIAL FIBERS; AND DEVELOP AN ANALYTICAL MODEL OF THE MATERIAL WHICH WILL PREDICT THE MECHANICAL RESPONSE OF THE PROPOSED MATERIAL; FABRICATE AND TEST TWO COMPOSITE LONG BONE COMPOSITE SEGMENTS, ESTABLISH FIRST ORDER MANUFACTURING AND COST PARAMETERS FOR THE PROPOSED MATERIAL; AND PREPARED THE SBIR PHASE II DESIGN, ANALYSIS, FABRICATION AND TEST PLANS.

SPARTA INC
21 WORTHEN RD
LEXINGTON, MA 02173
CONTRACT NUMBER:
DR R V RAMNATH
TITLE:
ANEW APPROACH TO MEMBRANE MIRROR STABILIZATION
TOPIC# 53 OFFICE: RADC/XPX IDENT#: 28581

THE PROBLEM OF INSTABILITY IN MEMBRANE MIRRORS USED IN WAVEFRONT CORRECTORS AND THEIR STABILIZATION BY ACTIVE CONTROL IS PROPOSED. SUCH SYSTEMS DISPLAY AN INSTABILITY IN THE TRANSVERSE VIBRATION, WHICH LEADS TO UNACCEPTABLE ERRORS IN OPTICS AND AN INABILITY TO INCREASE THE NUMBER OF MIRROR ACTUATORS TO LEVELS COMPATIBLE WITH FUTURE APPLICATIONS. RECOGNITION OF THE INSTABILITY MECHANISM AND ITS STABILIZATION ARE DIFFICULT DUE TO THE MATHEMATICAL COMPLEXITY. THE POWERFUL GMS TECHNIQUE DEVELOPED BY THE PRINCIPAL INVESTIGATOR WILL BE EMPLOYED TO SOLVE THE PROBLEM. SIMILAR SYSTEMS HAVE BEEN SUCCESSFULLY ANALYZED BY THIS METHOD. PHASE I GOALS INCLUDE (1) GMS ANALYSIS OF MEMBRANE DYNAMICS AND, (2) IDENTIFICATION OF PARAMETERS INFLUENCING INSTABILITIES, AND (3) DEVELOPMENT OF CONTROL LAWS FOR STABILIZATION AND/OR DESIGN CONSTRAINTS.

SPEC-TRAN CORP
50 HALL RD
STURBRIDGE, MA 01566
CONTRACT NUMBER:
LUBOS VACHA
TITLE:
OPTICALLY ADDRESSED MODULATOR MATERIALS
TOPIC# 49 OFFICE: RADC/XPX IDENT#: 28576

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FLUORIDE MATERIALS HAVE BEEN IDENTIFIED AS PROMISING CANDIDATES FOR HIGH-POWER OPTICAL SIGNAL PROCESSING APPLICATIONS, ESPECIALLY FOR THOSE IN WHICH SECOND HARMONIC GENERATION (SHG) FIGURES IN THE ELECTRONIC TRANSITIONS LEADING TO NONLINEARITY IN THE OPTICAL SUSCEPTIBILITY. THEY HAVE BEEN GIVEN THIS RECOGNITION DUE TO THEIR HIGH TRANSPARENCY, LOW DISPERSION, AND LOW ANGULAR SENSITIVITY. PREVIOUSLY INVESTIGATED FLUORIDE MATERIALS ARE RESTRICTED TO HIGH-POWER APPLICATIONS BECAUSE NONLINEAR RESPONSE COEFFICIENTS ARE ORDINARILY LOW. IT HAS BEEN SUGGESTED THAT LARGE NONLINEAR RESPONSES CAN BE ACHIEVED USING FLUORIDE STRUCTURES CONTAINING TRANSITION METAL IONS. THIS CLAIM IS MADE AS A CONSEQUENCE OF IMPORTANT CONTRIBUTIONS TO THE DIELECTRIC RESPONSE FROM LIGAND TO METAL CHARGE TRANSFER TRANSITIONS ASSOCIATED WITH COORDINATION CLUSTERS AROUND THE TRANSITION METALS. IT HAS FURTHER BEEN SUGGESTED THAT DETAILS IN GEOMETRIC STRUCTURE PLAY A SECONDARY ROLE TO COMPOSITIONAL FACTORS IN DETERMINING X(3). ON THE BASIS OF THESE FINDINGS, SPEC-TRAN PROPOSES DEVELOPING OPTICALLY ADDRESSED MODULATOR MATERIALS BY DOPING HEAVY METAL FLUORIDE GLASSES WITH OPTICALLY ACTIVE TRANSITION METAL IONS.

SPECTRA-FLOW INC
3189 D AIRWAY AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
MIKE SHELTON
TITLE:
TRANSPIRATION COOLED NOSETIP FLOW CONTROL DEVICE
TOPIC# 214 OFFICE: BMO/MYSC IDENT#: 28632

SPECTRA-FLOW, INC. PROPOSES TO DEVELOP A FLOW CONTROL DEVICE TO DELIVER FLUID FLOW TO A TRANSPIRATION COOLED NOSETIP. THE FLOW RATE WOULD BE BASED ON NOSETIP PRESSURE PARAMETERS. THE MECHANICAL FLOW CONTROLLER WOULD SENSE THIS NOSETIP PRESSURE PARAMETER AND ADJUST THE FLOW PER A BMO SUPPLIED FUNCTION. A COLD GAS PRESSURE SOURCE WOULD SUPPLY FLUID TO THE FLOW CONTROL DEVICE. THE NEW EXPULSION SYSTEM WOULD PROVIDE ACCURATE FLUID FLOW THEREBY REDUCING THE EXCESS FLUID VOLUME AND WEIGHT REQUIRED FOR CONVENTION WARM GAS EXPULSION SYSTEM INACCURACE COMPENSATION. THE NEW COLD GAS EXPULSIONS SYSTEM

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IS SIGNIFICANTLY SMALLER AND LIGHTER THAN CONVENTIONAL WARM GAS EXPULSION SYSTEMS.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER:
DR CHARLES C BLATCHLEY
TITLE:
STRAIN MEASUREMENT IN TURBINE ENGINES
TOPIC# 126 OFFICE: AFWAL/ASD IDENT#: 26966

THE PROPOSED RESEARCH WILL TEST THE FEASIBILITY OF REMOTELY MEASURING MECHANICAL STRAIN IN HOSTILE ENVIRONMENTS AND ON MOVING ENGINE PARTS OR OTHER STRUCTURES USING A SPECIAL LOW LEVEL RADIATION SOURCE PRODUCED BENEATH THE SURFACE. STRAIN ON THE PART IN QUESTION WILL CHANGE THE ATTENUATION OF SURFACE MATERIAL COVERING THE SOURCE AND THUS CHANGE THE RELAYED SIGNAL WHICH IS ULTIMATELY MONITORED BY A DETECTOR EXTERNAL TO THE ENGINE. CHANGES IN STRAIN THEN PRODUCE CORRESPONDING CHANGES IN COUNTING RATE AT THE DETECTOR. BECAUSE OF THE DESIGN FOR SUCH A STRAIN GAUGE, THE SENSOR SHOULD BE SUITABLE FOR HIGH TEMPERATURES AND WILL NOT INTERFERE WITH FLOW BECAUSE IT DOES NOT PROTRUDE INTO THE STREAM, OR CHANGE THE SURFACE SHAPE IN ANY WAY. ONLY THE EXTERNAL DETECTOR SYSTEM WOULD REQUIRE ELECTRICAL CONNECTIONS AND NO PENETRATING WIRES OR ELECTRICAL FEEDTHROUGH WOULD BE NEEDED. A SMALL CORRECTION FOR TEMPERATURE CHANGES, AS IS ALSO REQUIRED BY CONVENTIONAL STRAIN GAGUES, MAY BE NECESSARY. THIS TYPE OF GAUGE WOULD BE IDEAL FOR MONITORING STRAIN ON MOVING PARTS, FOR EXAMPLE, IN OPERATING TURBINE ENGINES. RAPIDLY OF MEAUSRMENT WOULD BE A FUNCTION OF SOURCE STRENGTH, BUT QUITE MODEST SOURCES WHICH DO NOT INVOLVE ANY HAZARD OR SPECIAL HANDLING COULD PRODUCE RELIABLE MEASUREMENTS EVERY 10 TO 20 SECONDS.

SPREAD SPECTRUM SCI & NAVSTAR SYS DEV
14717 PERRY PARK RD
PALMER LAKE, CO 80133
CONTRACT NUMBER:
ROBERT C DIXON
TITLE:
MINIATURIZED GPS RECEIVERS AND TRANSLATORS FOR SPACE TEST AND EVALUATION
TOPIC# 188 OFFICE: AFWL/PRC IDENT#: 27144

SUBMITTED BY

IT IS PROPOSED THAT MINIATURIZED GPS TRANSLATORS BE DEVELOPED TO MEET LOW VOLUME, WEIGHT AND POWER CONSUMPTION REQUIREMENTS FOR INSTRUMENTATION ON BOARD SDI TESTS SUCH AS THE SPACE-BASED INTERCEPTOR (SBI). THE PROPOSED TRANSLATOR WOULD REBROADCAST THE GPS SATELLITE SIGNALS FROM SBI PROJECTILES TO A MASTER GPS RECEIVER AT THE SBI PLATFORM WHERE THE LOCATIONS OF THE INTERCEPTORS ARE COMPUTED. SINCE THE MASTER GPS RECEIVER TRACKS BOTH THE ACTUAL AND TRANSLATED GPS SIGNALS, THE LOCATION OF TRANSLATOR RELATIVE TO THE MASTER RECEIVER CAN BE DETERMINED TO WITHIN A FEW METERS USING DIFFERENTICAL GPS TECHNIQUES. IT IS ALSO PROPOSED THAT GPS BE USED FOR POSITIONING AND POINTING SPACE BASED KINETIC ENERGY WEAPONS PRIOR TO FIRING. CONVENTIONAL GPS NAVIGATION WILL PROVIDE THE SBI PLATFORM LOCATION TO 18 M (SEP). USING CARRIER PHASE INTERFEROMETRY FROM MULTIPLE ANTENNAE, THE SBI PLATFORM CAN BE POINTED TO WITHIN 50 MICRO-RADIANS (10 ARC-SECONDS). THIS WILL ALLOW AN SBI PROJECTILE TO BE PLACED WITHIN 30 M OF THE TARGET AFTER A 500 KM FLIGHT WITHOUT MID-COURSE CORRECTIONS BEING APPLIED. THE PHASE I STUDY SHALL INCLUDE EQUIPMENT REQUIREMENTS FOR EXISTING SDI PROGRAMS, RESEARCH OF SUITABLE ELECTRONIC TECHNOLOGIES AND EXISTING HARDWARE THAT MAY BE ADAPTED TO MEET THE REQUIREMENTS. THE STUDY SHALL CONCLUDE WITH A TRADE-OFF ANALYSIS OF THE DIFFERENT SYSTEM ARCHITECTURES WITH A RECOMMENDATION ON THE MOST ADVANTAGEOUS SYSTEM FOR DEVELOPMENT BASED ON RISK, COST AND ADVANTAGE COMPARISONS.

ST&E INC
1214 CONCANNON BLVD
LIVERMORE, CA 94550
CONTRACT NUMBER:
DR STANLEY M KLAINER
TITLE:
A GASEOUS OXYGEN FIBER OPTIC CHEMICAL SENSOR (FOCS) FOR ON-BOARD AIRCRAFT USE
TOPIC# 66 OFFICE: SAM/HSD IDENT#: 26882

A FIBER OPTIC CHEMICAL SENSOR (FOCS) IS PROPOSED TO MEASURE THE BREATHING OXYGEN CONCENTRATION ON-BOARD AIRCRAFT. THE FOCS WILL MONITOR AND CONTROL THE OUTPUT OF THE ON-BOARD OXYGEN GENERATING SYSTEM (OBOGS) SO THAT OXYGEN CONCENTRATIONS REMAIN WITHIN THE

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DESIRED LIMITS. THE FOCS WILL BE DESIGNED SO THAT IT SEES REPRESENTATIVE VOLUMES (SELECTABLE) AND CONCENTRATIONS OF OXYGEN. THE OXYGEN SENSOR WOULD BE A COMPLETELY SOLID STATE DEVICE WITH NO MOVING PARTS. IT WILL BE: SIMPLE, SPECIFIC, SENSITIVE (DESIGNATED DYNAMIC RANGE), LIGHT-WEIGHT, LOW POWER, LONG-LIVED, RELIABLE, TEMPERATURE AND PRESSURE INSENSITIVE, UNAFFECTED BY ACCELERATION, FAST RESPONDING AND HAVE A FEED-BACK CIRCUIT TO CONTROL THE OBOG. WITH THE EXCEPTION OF RIDGED TIPS, I.E. THE SENSOR (<2 cm LONG), THE FIBER OPTICS ARE FLEXIBLE FOR EASY PLACEMENT. THE SENSING CHEMISTRY IS REVERSIBLE SO THAT NO ROUTINE SERVICE OF THE SENSOR IS REQUIRED. THE SUPPORT INSTRUMENTATION IS SIMPLE AND CAN BE VERY SMALL BECAUSE SPECIFICITY AND SENSITIVITY ARE RELEGATED TO THE FOCS.

STAC
126 W DEL MAR BLVD
PASADENA, CA 91105
CONTRACT NUMBER:
DR JOHN E TANNER
TITLE:
HIGH SPEED CMOS IMAGING ARRAY DEVELOPMENT
TOPIC# 2 OFFICE: AD/PMR IDENT#: 23303

WE PROPOSE TO INVESTIGATE, DEVELOP, AND HAVE FABRICATED A HIGH-SPEED IMAGING SENSOR BASED ON A CUSTOM MOS INTEGRATED CIRCUIT. THE SENSOR WILL HAVE AN IMAGING RESOLUTION OF AT LEAST 400X400 PIXELS AND OPERATE A FRAME RATES TO 10,000 FRAMES/SECOND. THIS SENSOR WILL BE AN EXTENSION OF OUR CURRENT DEVELOPMENT OF A 256X256 PIXEL SENSOR THAT OPERATES AT FRAME RATES OF 2000 FRAMES/SECOND. OUR APPROACH WILL UTILIZE STANDARD READILY AVAILABLE CMOS BULK INTEGRATED CIRCUIT TECHNOLOGY SO PRODUCTS ARISING FROM THIS R&D CAN BE FABRICATED RELIABLY AND ECONOMICALLY BY A NUMBER OF VENDORS. WE HAVE DEMONSTRATED THE FEASIBILITY OF FABRICATING PHOTOSENSOR ARRAYS USING STANDARD CMOS PROCESSES. ON-CHIP CIRCUITS PROVIDE SCANNING, LOGARITHMIC COMPRESSION (OPTICAL), AMPLIFICATION, SAMPLE-AND-HOLD, MULTIPLEXING, AND ROW AND COLUMN DECODING. WE HAVE DEMONSTRATED CUSTOM CMOS IMAGERS IN OUR LABORATORY THAT OPERATE AT FRAME RATES IN EXCESS OF 1000 FRAMES/SECOND. WE PRESENTLY HAVE A DESIGN IN FABRICATION THAT IS PROJECTED TO OPERATE IN EXCESS OF 2000 FRAMES/SECOND. THE DEVELOPMENT OF A 10,000 FRAME/SECOND VIDEO SENSOR IS A NATURAL

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EXTENSION OF THIS PRIOR WORK AND LEADS DIRECTLY TO AN INEXPENSIVE PRODUCT WITH WIDE APPLICABILITY IN COMMERCIAL, ACADEMIC, AND MILITARY MARKETS.

SURFACE OPTICS CORP
9929 HIBERT ST - STE 'C'
SAN DIEGO, CA 92131
CONTRACT NUMBER:
DR JOHN T NEU
TITLE:
HIGH TEMPERATURE SURFACE EMISSIVITY MEASUREMENT SYSTEM
TOPIC# 22 OFFICE: ADEC/DOT IDENT#: 28587

SURFACE OPTICS CORPORATION PROPOSES A STUDY PROGRAM LEADING TO THE DEVELOPMENT OF A BENCH-TYPE EMISSOMETER CAPABLE OF MEASURING THE NORMAL SPECTRAL EMISSIVITIES OF METALLIC AND NON-METALLIC MATERIALS IN THE WAVELENGTH REGION FROM 0 TO 10 MICROMETERS, AND OVER A TEMPERATURE RANGE FROM 2000 TO 5000 DEGREES R. THE SYSTEM IS INTENDED TO GENERATE A SURFACE PROPERTY DATA BASE FOR THE DETERMINATION OF TEMPERATURES ENCOUNTERED IN HYPERSONIC WIND TUNNEL, ARC TUNNEL AND TEST RANGE EXPERIMENTS. PHASE I OF THE PROPOSED PROGRAM WILL CONSIST OF AN ASSESSMENT OF PRIOR ART CONTAINED IN BOTH THE DOMESTIC AND FOREIGN LITERATURE, AN EVALUATION OF THE TECHNOLOGY EMBODIED IN CURRENTLY OPERATIONAL TEST FACILITIES, A CRITICAL ASSESSMENT OF VARIOUS DESIGN CONCEPTS, AND FINALLY, THE FORMULATION OF AN OPTIMUM DESIGN OF A BENCH-TYPE INSTRUMENT SUITED FOR LABORATORY USE. THE AVAILABILITY OF COMPONENT SUCH AS A 3000 DEG K BLACKBODY, A PERKIN-ELMER SPECTROPHOTOMETER, AND TRANSFER OPTICS ON THE PREMISES OF THE SURFACE OPTICS CORPORATION OFFERS THE OPTION OF VERIFYING THE PROPOSED SYSTEM IN A BREADBOARD VERSION.

SURVICE ENGINEERING CO
PO BOX 693 - 22 W PENNSYLVANIA AVE
BEL AIR, MD 21014
CONTRACT NUMBER:
DONALD W MOWRER
TITLE:
EXPERT SYSTEMS APPLIED TO VULNERABILITY ASSESSMENTS
TOPIC# 96 OFFICE: AFWAL/ASD IDENT#: 26923

SUBMITTED BY

AN EXPERT SYSTEM IS ONE WHICH CAN PERFORM AT THE LEVEL OF AN EXPERT IN A SPECIFIC KNOWLEDGE DOMAIN. TARGET APPLICATION AREAS FOR EXPERT SYSTEMS INCLUDE THOSE AREAS FOR WHICH THERE ARE PERHAPS A FEW SIMPLE UNDERLYING THEORIES AND A RATHER LARGE ACCUMULATION OF HIGH LEVEL KNOWLEDGE CONSIDERED OF PARAMOUNT IMPORTANCE IN THE ANALYTIC PROBLEM SOLVING PROCESS. PRESENT VULNERABILITY ASSESSMENT COMPUTER CODE REQUIRE A TREMENDOUS AMOUNT OF MANUAL PREPROCESSING. MUCH OF THIS INPUT MUST BE GENERATED USING SUBJECTIVE JUDGEMENT. A SKILLED VULNERABILITY ANALYST CAN PROVIDE INPUTS TO THE COMPUTER CODES WHICH PRODUCE REASONABLE VULNERABILITY ASSESSMENTS; HOWEVER, ASSESSMENTS PRODUCED BY LESS SKILLED ANALYST ARE ERROR PRONE DUE TO DIFFERENCES IN PERCEPTION AND EXPERIENCE LEVEL. EXPERT GUIDANCE IN THE MANUAL PREPROCESSING ASSOCIATED WITH VULNERABILITY ASSESSMENTS IS NEEDED TO PROVIDE CONSISTENCY AND LESSEN THE DEGREE OF SUBJECTIVITY. THIS PHASE I EFFORT WILL INVESTIGATE THE FEASIBILITY OF DEVELOPING A COMPUTER ENHANCED EXPERT SYSTEM FOR PERFORMING VULNERABILITY ASSESSMENTS.

SYNAPSE COMPUTER SERVICES
21900 MARYLEE ST - STE 244
WOODLAND HILLS, CA 91367
CONTRACT NUMBER:
DR HENRY G BAKER
TITLE:
A SINGLE-CHIP SYMBOL/SIGNAL PROCESSOR FOR EMBEDDED EXPERT SYSTEMS
TOPIC# 79 OFFICE: AFWAL/ASD IDENT#: 26899

A SINGLE CHIP INTEGRATED SYMBOLIC/NUMERIC PROCESSOR FOR EMBEDDED REAL-TIME EXPERT SYSTEMS WOULD GREATLY REDUCE THE COST AND DEVELOPMENT EFFORT FOR THE NEXT GENERATION OF DOD "BRILLANT" WEAPONS. MODERN "DIGITAL SIGNAL PROCESSING" SINGLE-CHIP COMPUTERS SUCH AS THE AT&T DSP32C AND THE TEXAS INSTRUMENTS 320C30 CAN ADDRESS MORE THAN 16 MEGABYTES OF MEMORY AND PROVIDE BETTER THAN 10 MIP AND 20 MFLOP (SINGLE PRECISION) PERFORMANCE WHICH IS ADEQUATE FOR MANY SIGNAL PROCESSING TASKS, AND WOULD SUPPORT A VERY FAST COMBINED SYMBOLIC/SIGNAL PROCESSING CAPABILITY IF THE APPROPRIATE SOFTWARE WERE DEVELOPED. THE GOAL OF THIS PROJECT IS TO DEVELOP THE SOFTWARE ARCHITECTURE FOR A PORTABLE REAL-TIME EXECUTION ENVIRONMENT AND A PORTABLE CROSS-COMPILER FOR COMMON LISP FOR ONE OF THESE CHIPS AS A

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BASE FOR EMBEDDED REAL-TIME EXPERT SYSTEMS. THIS EXECUTION ENVIRONMENT FOR SINGLE-CHIP DIGITAL SIGNAL PROCESSING CHIPS WOULD HAVE THE FOLLOWING CHARACTERISTICS: PROGRAMMED IN STANDARD, PORTABLE COMMON LISP (VERY LITTLE ASSEMBLY LANGUAGE); COMPLETE REAL-TIME OPERATING SYSTEM WHICH OPERATES ON THE "BARE CHIP" (NO OTHER OPERATING SYSTEM); HIGH PERFORMANCE INTEGER AND FLOATING POINT PERFORMANCE FOR SIGNAL AND IMAGE PROCESSING; HIGH PERFORMANCE I/O; VERY LOW MAXIMUM INTERRUPT LATENCY (I.E., "REAL-TIME" GARBAGE COLLECTOR); EXTENSIONS FOR PARALLELISM THROUGH COOPERATIVE EXECUTION OF MULTIPLE SINGLE-CHIP PROCESSORS, AND PROGRAMMED USING STANDARD WORKSTATIONS AND PERSONAL COMPUTERS.

SYNETICS CORP
540 EDGEWATER DR
WAKEFIELD, MA 01880
CONTRACT NUMBER:
RANJEET UTTAMSINGH
TITLE:
ARTIFIFICAL INTELLIGENCE APPLIED TO AERONAUTICAL SYSTEMS
TOPIC# 149 OFFICE: AFWAL/ASD IDENT#: 27010

THE OBJECTIVE OF THIS PROPOSED EFFORT IS TO ESTABLISH THE FEASIBILITY OF APPLYING EXPERT SYSTEMS AND FINITE ELEMENT ANALYSIS TECHNOLOGIES TO THE PROBLEMS OF AIR BATTLE DAMAGE ASSESSMENT AND MAINTENANCE SCHEDULING AND MANAGEMENT FOR THE PURPOSE OF MEETING SPECIFIC BATTLE READINESS GOALS. AS AIRCRAFT SYSTEMS INCREASE IN COMPLEXITY, BATTLE DAMAGE ASSESSMENT AND MAINTENANCE MANAGEMENT ARE TASKS THAT WOULD BE PERFORMED MORE EFFECTIVELY THROUGH THE USE OF KNOWLEDGE BASED DECISION AIDS AND APPROPRIATE ANALYTICAL TOOLS. ONE ASPECT OF THIS PHASE I EFFORT IS INTENDED TO DEMONSTRATE THAT EXPERT SYSTEMS INTEGRATED WITH FINITE ELEMENT ANALYSIS TOOLS CAN GREATLY ENHANCE THE ACCURACY WITH WHICH THE TASK OF BATTLE DAMAGE ASSESSMENT CAN BE PERFORMED ON A GIVEN AIRCRAFT. THE OTHER ASPECT OF THIS EFFORT IS TO DEMONSTRATE THAT AN OVERALL MAINTENANCE SCHEDULE CAN BE GENERATED BY EXPERT SYSTEM DECISION AIDS THAT HAVE AS INPUTS THE OUTPUTS OF THE BATTLE DAMAGE ASSESSMENT EXPERT SYSTEMS AS WELL AS THE OVERALL REQUIRED BATTLE READINESS GOAL. THE FINAL RESULTS OF THIS PHASE I EFFORT WILL BE A PROOF-OF-CONCEPT SOFTWARE DEMONSTRATION AS WELL AS A REPORT ADDRESSING THE SCOPE, DESIGN IMPLEMENTATION ISSUES, AND

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BENEFITS OF THE OVERALL SYSTEM.

TAB SALES CO
704 W MICHIGAN AVE
PENSACOLA, FL 32505
CONTRACT NUMBER:
THOMAS A BUCHANAN
TITLE:
HIGH VELOCITY GUIDE TRACK TAPERING SYSTEM
TOPIC# 26 OFFICE: AEDC/DOT IDENT#: 28593

THE PROJECT OBJECTIVE IS TO EXAMINE THE FEASIBILITY AND PRACTICALITY OF DEVELOPING A REMOTE TRACK TAPERING SYSTEM UTILIZING AN ADJUSTABLE LENGTH, RAIL FASTNER DEVICE. THE EFFORT IS PLANNED AND EXPECTED TO YIELD A PROTOTYPE DEVICE AND A DEFINITION OF THE COMPUTER HARDWARE AND SOFTWARE SUFFICIENT TO MANAGE THE REMOTE TAPERING FUNCTION. THE INITIAL EFFORT IS TO PROVIDE A MEANS TO INCREMENTALLY REDUCE THE FINAL 200 FEET, BORE DIAMETER OF 1000 FOOT ORTHOGONAL TRACK SYSTEM. THE DEVELOPMENT EFFORT WILL CONSIST OF FOUR PARTS: (1) RESEARCH TO SELECT THE BEST AVAILABLE MATERIAL, (2) PRELIMINARY DESIGN AND COMPONENT FABRICATION, (3) TESTING AND EVALUATION OF EMPIRICAL RESULTS TO DETERMINE THE OPTIMUM MECHANICAL AND ELECTRICAL CONFIGURATIONS, AND (4) IDENTIFICATION OF COMPUTER SOFTWARE AND PERIPHERAL HARDWARE ELEMENTS REQUIRED FOR A WORKABLE SYSTEM.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95032
CONTRACT NUMBER:
JIM REYNOLDS
TITLE:
3-D ANALYSIS SOFTWARE OF NEAR EARTH SPACE
TOPIC# 162 OFFICE: AFSD IDENT#: 27098

A FULLY OPERATIONAL IBM PC-AT BASED SPACE SYSTEM CONCEPT GENERATION AND ANALYSIS WORKSTATION WILL BE DESIGNED AND DEVELOPED. THIS WORKSTATION WILL ALLOW THE USER TO VIEW AN ANIMATION OF THE POSITIONS OF

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THE SUN, MOON, PLANETS, EARTH SATELLITES AND EARTH COASTLINE BOUNDARIES FROM SELECTED ORBITS AND FIELDS OF VIEW. STATE-OF-THE-ART GRAPHICS ANIMATION TECHNOLOGY WILL BE ENGINEERED SPECIFICALLY FOR THIS APPLICATION. EXISTING SATELLITE EPHEMERIS ALGORITHMS WILL BE HIGHLY ACCELERATED. THE SOFTWARE WILL BE CAPABLE OF ANIMATING ALL OBJECTS VISIBLE IN THE USER-DEFINED VIEWPORT AT RATES OF UP TO 10 TIMES REAL-TIME WHILE MAINTAINING MINIMAL INTER-FRAME AND SCREEN REFRESH TIMES. THE OBSERVER'S VANTAGE POINT MAY BE SPECIFIED AS AN EARTH-CENTERED ORBIT, A SUN-CENTERED ORBIT, OR STAR-FIXED.

TECHNICAL RESEARCH ASSOCS
410 CHIPETA WY - STE 222
SALT LAKE CITY, UT 84108
CONTRACT NUMBER:
GAIL BOWERS-IRONS
TITLE:
THE BIODEGRADATION OF FLUOROSILICONE
TOPIC# 109 OFFICE: AFWAL/ASD IDENT#: 26939

IMPORTANT IN AIRCRAFT, FLUOROSILICONES ARE WEATHERPROOF, WATER RESISTANT AND MOST IMPORTANTLY, LONG-LIVED. HOWEVER, THERE ARE NORMAL MAINTENANCE AND REPAIR INTERVALS DURING WHICH THE AIRCRAFT MUST BE STRIPPED. PRESENTLY, PHENOLIC SOLVENTS, HOT ALKALI METALS, FLUORINE GAS OR CHLORINE TRIFLUORIDE ARE EMPLOYED IN CONJUNCTION WITH SCRAPING. THIS CAN DAMAGE SURFACE AND UNDERLYING COMPOSITE MATERIAL. MICROBIAL DEGRADATION IS A SAFER, MORE EFFICIENT AND INEXPENSIVE TECHNIQUE AND CAN BE TARGET SELECTIVE. TECHNICAL RESEARCH ASSOCIATES PROPOSES TO STUDY THE FEASIBILITY OF DELIBERATELY BIODEGRADING OR TRANSFORMING THE FULLY CHARACTERIZED AIR FORCE CURED AND UNCURED FLUOROSILICONE ELASTOMERS. DEGRADATION EXPERIMENTS WILL BE RUN IN CONJUNCTION WITH ANALYTICAL AND ENZYMATIC ANALYSIS TO STUDY THE METABOLIC PROCESS. THE RATE AND EXTENT OF THE BIODEGRADABILITY OR TRANSFORMATION WILL BE EVALUATED, EXAMINING CHEMICAL, PHYSICAL AND ENVIRONMENTAL ASPECTS, IN ORDER TO FULLY OPTIMIZED THE BIOLOGICAL PROCESS.

TECHNICAL RESEARCH ASSOCS
410 CHIPETA WY - STE 222
SALT LAKE CITY, UT 84108
CONTRACT NUMBER:
GAIL BOWERS-IRONS
TITLE:
THE ENZYMATIC DEGRADATION OF POLYURETHANE PAINT BY SUBSTRATE ADDITION
TOPIC# 109 OFFICE: AFWAL/ASD IDENT#: 26940

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ENZYMES HAVE BEEN USED IN INDUSTRY, FOR ANALYTICAL PURPOSES AND IN MEDICINE SINCE THE TURN OF THE CENTURY. THE LOW CONCENTRATION OF ENZYMES WHICH ARE NORMALLY PRODUCED BY WILD STRAINS, HOWEVER, WAS A CONSIDERABLE HINDRANCE FOR NEW RESEARCH AND APPLICATION UNTIL RECENT ADVANCES IN FERMENTATION CONDITIONS, GENETICS AND IMMOBILIZATION PROCESSES. THESE BREAKTHROUGHS HAVE ALLOWED THE ENZYME TECHNOLOGY FIELD TO BROADEN. ONE OF THE NEW AREAS OF RESEARCH IS ENZYMATIC DEGRADATION. TECHNICAL RESEARCH ASSOCIATES PROPOSES TO STUDY THE FEASIBILITY OF ENZYMATICALLY DEGRADING THE AIR FORCE POLYURETHANE PAINT LINE WITH SUBSTRATE ADDITION. THIS WOULD, IF SUCCESSFUL, REMOVE THE NECESSITY OF USING TOXIC, OFTEN CARCINOGENIC CHEMICALS IN TIME-CONSUMING, INEFFICIENT AND COSTLY PROCEDURES.

TECHNO-SCIENCES INC
7833 WALKER DR - STE 620
GREENBELT, MD 20770
CONTRACT NUMBER:
DR WILLIAM BENNETT
TITLE:
ROBUST CONTROL DESIGN FOR FLIGHT CONTROL
TOPIC# 101 OFFICE: AFWAL/ASD IDENT#: 26928

MODERN REQUIREMENTS FOR HIGH PERFORMANCE AIRCRAFT REQUIRE ADVANCED CONTROL CONFIGURED FLIGHT VEHICLES WHERE AN INCREASING RELIANCE IS PLACED ON COMPUTER CONTROL SYSTEMS FOR FLIGHT PERFORMANCE. THE INCREASED RELIANCE ON COMPUTER CONTROL PLACES SIGNIFICANT REQUIREMENTS ON SUCH SYSTEMS TO BE RELIABLE AND ROBUST IN THE ACTUAL FLIGHT ENVIRONMENT. WE PROPOSE TO DEVELOP AN INTEGRATED DESIGN PACKAGE FOR ADVANCED FLIGHT CONTROL SYSTEMS WITH PARTICULAR EMPHASIS ON ROBUST PERFORMANCE IN THE FACE OF MODELING UNCERTAINTY APPROPRIATE FOR HIGH PERFORMANCE FLIGHT CONTRO. OUR PRIMARY GOALS ARE: 1) TO DEMONSTRATE THE CHARACTERIZATION OF MODELING UNCERTAINTY INCURRED BY LINEARIZATION OF THE NONLINEAR FLIGHT DYNAMICS AND TO CONSIDER VARIOUS ALTERNATIVES, 2) TO INVESTIGATE AND PRIORITIZE AVAILABLE METHODS FOR SYNTHESIS OF ROBUST, MULTILOOP CONTROL SYSTEMS FOR THIS APPLICATION, 3) TO DEVELOP OPTIONS FOR CONTROL COMPUTER IMPLEMENTATION OF SUCH SYSTEMS, AND 4) TO ASSESS THE IMPACT OF ROBUST CONTROL METHODS FOR ENHANCING FLIGHT CONTROL PERFORMANCE IN TERMS OF HANDLING QUALITY

SUBMITTED BY

ASSESSMENT.

TECHNOLOGY & MANAGEMENT SYSTEMS INC
99 S BEDFORD ST - STE 211
BURLINGTON, MA 01803
CONTRACT NUMBER:
PHANI K RAJ
TITLE:
CLOSED CYCLE DIESEL POWER SYSTEM TECHNOLOGY
TOPIC# 208 OFFICE: BMO/MYSC IDENT#: 28622

A CLOSED CYCLE DIESEL POWER SYSTEM PROVIDES SEVERAL ADVANTAGES FOR USE IN ADVANCED MISSILE BASES. AMONG OTHER THINGS, THIS TECHNOLOGY CAN BE USED IN ENCLOSED BASES SUCH AS SILOS AND UNDERGROUND BASES DUE TO ITS VERY LOW EXHAUST EMISSIONS AND EMISSION ABSORPTION. ALSO, A VERY LOW THERMAL SIGNATURE IS PRESENTED MAKING IT IDEAL WHEN REMOTE SENSING OF THE BASE IS TO BE THWARTED. SEVERAL TECHNOLOGY ISSUES RELATED TO THE USE OF CLOSED CYCLE DIESEL FOR MISSILE BASE ENDURANCE POWER GENERATION NEED TO BE STUDIED. THESE INCLUDE ENGINE EFFICIENCY AND RELIABILITY VARIATIONS WITH DIFFERENT WORKING FLUIDS (AIR, CO(2), ARGON, HELIUM, ETC.), PISTON CORROSION PROBLEMS WITH THE USE OF PURE OXYGEN AS THE OXIDANT, ETC. PRE-PROTOTYPE TESTING IS NEEDED TO OBTAIN CRITICAL DESIGN PARAMETERS. THIS PROPOSAL ADDRESSES THE STUDY OF THE VARIOUS ISSUES IN THE SELECTION OF THIS TECHNOLOGY FOR USE IN A MISSILE BASE AND THE PLANNING OF A TEST MATRIX FOR IMPLEMENTATION IN PHASE II STUDY. ASSESSMENT OF THE CURRENT STATUS OF TECHNOLOGY, ITS USE IN OTHER INDUSTRIES, AND PROBLEMS ENCOUNTERED IS ALSO PROPOSED.

TECHNOLOGY & MANAGEMENT SYSTEMS INC
99 S BEDFORD ST - STE 211
BURLINGTON, MA 01803
CONTRACT NUMBER:
PHANI K RAJ
TITLE:
SAFE AND RELIABLE CHEMICAL STORAGE AND IN SITU GENERATION TECHNOLOGIES FOR USE IN ADVANCED MISSILE BASING MODES
TOPIC# 210 OFFICE: BMO/MYSC IDENT#: 28625

SUBMITTED BY

U.S. AIR FORCE IS SPONSORING RESEARCH IN SEVERAL DIFFERENT CONCEPTS OF ADVANCED MISSILE BASING MODES FOR THE NEXT GENERATION OF ICBM'S. THESE INCLUDE THE RAIL GARRISON, SMALL MISSILE AND OTHER CONCEPTS. THE COMPLETELY INDEPENDENT LONG DURATION OPERATION OF THESE BASES (DURING WAR TIME) REQUIRES THAT THEY BE EQUIPPED WITH LIFE SUPPORT AND POWER GENERATION (LSPG) SYSTEMS. BECAUSE OF THE EXTREME CONDITIONS UNDER WHICH THE BASES MAY HAVE TO OPERATE, A NEED EXISTS FOR DEVELOPING NEW, INNOVATIVE AND RELIABLE TECHNOLOGIES FOR LIFE SUPPORT AND POWER GENERATION. A PART OF ANY NEW TECHNOLOGY RELATED TO LS & PG IS THE STORING AND USE OF HAZARDOUS CHEMICALS. THE BASE OPERATION AND MISSION SUCCESS MUST BE ASSURED BY MAKING THE CHEMICAL STORAGE COMPLETELY SAFE. THIS PROPOSAL ADDRESSES THE REVIEW OF AVAILABLE CHEMICAL STORAGE AND IN SITU PRODUCTION TECHNOLOGIES FOR ADVANCED BASING MODES. IN PHASE I, VARIOUS SYSTEMS WILL BE EVALUATED AND THE MOST PROMISING TECHNOLOGY WILL BE IDENTIFIED FOR LARGE SCALE STORAGE OR GENERATION (FOR EXAMPLE, IN UNDERGROUND STORAGE FACILITIES). A PROGRAM PLAN WILL BE DEVELOPED FOR PRE-PROTOTYPE TESTS IN PHASE II. GENERATION OF HYDROGEN FOR USE IN A FUEL CELL IS USED AS AN EXAMPLE TO DESCRIBE OUR APPROACH.

TECHNOLOGY & MANAGEMENT SYSTEMS INC
99 S BEDFORD ST - STE 211
BURLINGTON, MA 01803
CONTRACT NUMBER:
JOHN A MORRIS
TITLE:
CONSIDERATIONS OF SAFE OXYGEN STORAGE AND GENERATION FOR LIFE SUPPORT AND POWER GENERATION IN ADVANCED MISSILE BASING SYSTEMS
TOPIC# 210 OFFICE: BMO/MYSC IDENT#: 28626

THE U.S. AIR FORCE IS CONDUCTING RESEARCH & DEVELOPMENT STUDIES ON ADVANCED MISSILE BASES DESIGNED TO PROVIDE STRATEGIC DETERRANCE AND POST ATTACK RESPONSE CAPABILITIES. ONE IMPORTANT FEATURE COMMON TO ALL THE BASING MODES BEING CONSIDERED FOR THE NEXT GENERATION OF PEACE KEEPER (MX) MISSILE IS THE ABILITY OF THE BASE TO WITHSTAND A NUCLEAR ATTACK AND RESPOND WITH A RETALIATORY STRIKE. IF THE BASE IS TO SURVIVE AND FUNCTION AFTER A NEARBY NUCLEAR ATTACK, IT MUST HAVE INDEPENDENT LIFE SUPPORT AND POWER GENERATION SYSTEMS. RESEARCH

SUBMITTED BY

INTO OXYGEN STORAGE AND GENERATION METHODS IS NEEDED TO OFFER SAFE, RELIABLE SYSTEMS FOR THESE MISSILE BASES. PAST STUDIES HAVE SHOWN THAT STORING OXYGEN AS A CRYOGENIC LIQUID (LOX) IS DANGEROUS AND THAT OXYGEN STORED IN THE FORM OF A SOLID, AS SODIUM CHLORATE CANDLES, OFFERS AN ECONOMICALLY VIABLE AND SAFE ALTERNATIVE TO LOX. FOR THIS STUDY, WE PROPOSE TO REVIEW AND ANALYZE THE FEASIBILITY OF STORING LARGE AMOUNTS OF OXYGEN IN CHLORATE CANDLES WHICH WOULD GENERATE OXYGEN SAFELY ON DEMAND. THE RESULTS OF THIS PHASE I STUDY WOULD BE RECOMMENDATIONS FOR PHASE II PRE-PROTOTYPE SCALE TESTS OF THE MOST PROMISING CANDLE TYPES AND CANDLE SYSTEM CONFIGURATIONS.

TECHNOLOGY FOR COMMUNICATIONS INT'L
1625 STIERLIN RD
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER:
DR ROBERT L TANNER
TITLE:
QUANTIFYING EXCITATION OF GROUND WAVES BY BURIED AND NEAR-EARTH ANTENNAS
TOPIC# 28 OFFICE: ESD/XRB IDENT#: 28599

AN IMPORTANT FUNCTION OF SURVIVABLE C(3) SYSTEMS IS GROUND WAVE COMMUNICATION FOLLOWING A NUCLEAR EVENT. ANTENNAS MOST LIKELY TO SURVIVE SUCH EVENTS ARE BURIED OR LOW PROFILE NEAR-THE-EARTH ANTENNAS. HOWEVER, THE GROUND WAVE FIELD STRENGTH FOR SUCH ANTENNAS IS NOT EASILY CALCULATED. USUALLY, SUCH CALCULATIONS ARE BASED ON COMPARING THE ANTENNA IN QUESTION TO A "STANDARD" ELECTRICALLY SHORT VERTICAL MONOPOLE. FIELD STRENGTH CURVES ARE READILY AVAILABLE FOR THE "STANDARD" ANTENNA FROM SUCH SOURCES AS THE CCIR RECOMMENDATION 368-4. SUCH GAIN DETERMINATIONS AT ZERO DEGREES ELEVATION ANGLE, HOWEVER, ASSUME PERFECTLY CONDUCTING EARTH. THIS METHOD CANNOT BE APPLIED TO BURIED ANTENNAS SINCE THEY WOULD NOT RADIATE IN A PRE-FECTLY CONDUCTING EARTH. THEIR ABILITY TO RADIATE DEPENDS UPON THE EARTH'S FINITE CONDUCTIVITY AND PERMITTIVITY. THEREFORE, OTHER METHODS OF CALCULATION MUST BE USED. TCI PROPOSES TO UTILIZE ITS ANALYTICAL EXPERTISE TO ACCURATELY ANALYZE BURIED OR NEAR-EARTH HF ANTENNAS AND DEVELOP SPACE WAVE GAIN, EFFICIENCY AND GROUND WAVE STRENGTH OF THESE BURIED OR NEAR-EARTH ANTENNAS. A GOAL OF THE EFFORT WILL BE TO ESTABLISH A RELATIONSHIP BETWEEN THE GROUND WAVE

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LAUNCHING EFFICIENCY OF BURIED AND NEAR-EARTH ANTENNAS AND THE MORE CONVENTIONAL VERTICAL MONOPOLES, WHICH WILL PERMIT THE USE OF AVAILABLE GROUND WAVE PROPAGATION CURVES AND CALCULATION TECHNIQUES TO PREDICT THE PERFORMANCE OF C(3) APPLICATIONS OF BURIED AND NEAR-EARTH ANTENNAS.

TECHNOLOGY SYSTEMS INC
PO BOX 85
NORTH EDGECOMB, ME 04556
CONTRACT NUMBER:
CHARLES J BENTON
TITLE:
PROTOTYPE DEVELOPMENT OF A FLIGHT INSTRUCTION TUTORING SYSTEM
TOPIC# 67 OFFICE: AFHRL/HSD IDENT#: 26883

DEVELOPMENT OF A PC-BASED FLIGHT INSTRUCTION TUTORING SYSTEM WILL IMPROVE THE MOST BASIC CAPABILITIES OF AIR FORCE FLIGHT PERSONNEL, STANDARDIZE INITIAL TRAINING OF THE BASIC CONCEPTS OF FLIGHT, PROVIDE A FOUNDATION FOR THE ADVANCEMENT OF MODERN TRAINING METHODS, AND ALLOW INNOVATIONS ADDRESSING THIS AND OTHER TECHNOLOGIES TO BE STUDIED IN A CONTROLLED ENVIRONMENT. THE PROPOSED SYSTEM WILL PROVIDE AN EXCELLENT TRAINING ENVIRONMENT FOR THE DECLARATIVE AND PROCEDURAL STAGES OF THE LEARNING PROCESS. PHASE I WILL PRODUCE A SYSTEM POSSESSING A RANGE OF PRESENTATION METHODS (INCLUDING TEXT, STATIC AND DYNAMIC GRAPHICS), PLUS A T-41/C-172 FLIGHT SIMULATION CAPABILITY. A LESSON PLAN PROVIDING INSTRUCTION IN CONSTANT BANK TURNS AND ACCELERATED STALLS IS PROPOSED FOR PHASE I, WITH DEVELOPMENT OF A COMPLETE SYLLABUS FOR PRIMARY FLIGHT TRAINING TO BE PERFORMED DURING PHASE II.

THERMACORE INC
780 EDEN RD
LANCASTER, PA 17601
CONTRACT NUMBER:
BRIAN E SHANK
TITLE:
CARBON FIBER REINFORCED CERAMIC WING LEADING EDGE HEAT PIPES
TOPIC# 106 OFFICE: AFWAL/ASD IDENT#: 26936

SUBMITTED BY

CURRENT HYPERSONIC AIRCRAFT DESIGNS REQUIRE COOLING ON THEIR LEADING EDGE SURFACES. HEAT PIPES HAVE THE POTENTIAL OF PROVIDING A LOW-WEIGHT METHOD OF COOLING THESE SURFACES. HOWEVER, CURRENT HEAT PIPE DESIGNS REQUIRE AN AUXILIARY HEAT EXCHANGER COUPLED TO THE HEAT PIPE CONDENSER. THIS HEAT EXCHANGER IS REQUIRED TO REMOVE HEAT IN EXCESS OF THAT WHICH CAN BE RADIATED. THIS PROPOSAL OUTLINES A PROGRAM TO DESIGN A PASSIVE HEAT PIPE BASED ON CARBON FIBER REINFORCED CERAMIC MATERIALS. THE HEAT PIPE WILL OPERATE AT HIGH TEMPERATURES, 1800-2400 DEG C, SUCH THAT THE TOTAL INCIDENT HEAT LOAD CAN BE DISSIPATED BY RADIATION. A PROOF-OF-CONCEPT CARBON FIBER/CERAMIC HEAT PIPE WILL BE FABRICATED AND TESTED.

TI-NI ALLOY CO
2736 COLLEGE AVE
BERKELEY, CA 94705
CONTRACT NUMBER:
DR A DAVID JOHNSON
TITLE:
SHAPE-MEMORY ALLOY TACTILE FEEDBACK ACTUATOR
TOPIC# 73 OFFICE: AAMRL/HSD IDENT#: 26890

SHAPE-MEMORY ALLOYS (SMAs) SUCH AS NITINOL RESPOND TO TEMPERATURE CHANGES BY FRAMATIC ALTERATION OF THEIR PHYSICAL STIFFNESS AND/OR SHAPE. THE SHAPE RECOVERY, WHICH DEPENDS UPON A CRYSTALLINE PHASE CHANGE, MAY BE INITIATED BY HEAT FROM ELECTRICAL RESISTANCE HEATING OF THE SMA ELEMENT ITSELF. ACTUATORS UTILIZING SMAs WHICH EXERT SUFFICIENT FORCE TO BE USED AS TACTILE OUTPUT DEVICES MAY BE MADE VERY MINIATURE. ARRAYS OF SUCH TACTILE STIMULATORS CAN BE USED TO CONVEY INFORMATION, AS IN REFRESHABLE BRAILLE DISPLAYS AND TACTICLE GRAPHICS PADS. A SENSE OF TOUCH MAY BE CONVEYED BY A GLOVE IN WHICH THE WEARER'S FINGERS CONTACT AN ARRAY OF MINIATURE SMA-DRIVEN "DOTS" UNDER COMPUTER CONTROL. SUCH A DEVICE IS USEFUL IN VIRTUAL COCKPIT FLIGHT SIMULATION. THE PROPOSED RESEARCH FOCUSES ON THE DEVELOPMENT OF A COMPACT ARRAY OF PROGRAMMABLE TACTILE ELEMENTS FLEXIBLE ENOUGH TO FIT IN A GLOVE AND FORCEFUL ENOUGH TO GIVE A REALISTIC SENSE OF TOUCH.

TOYON RESEARCH CORP
75 AERO CAMINO - STE A
GOLETA, CA 93117
CONTRACT NUMBER:
THOMAS W GEYER
TITLE:
NEW CONCEPTS AND INNOVATIONS FOR AERONAUTICAL SYSTEMS/SUBSYSTEMS-SOF AIRCRAFT
TOPIC# 146 OFFICE: AFWAL/ASD IDENT#: 27004

SUBMITTED BY

SPECIAL OPERATIONS FORCES (SOFs) HAVE BEEN AND CONTINUE TO BE RELIED UPON FOR USE IN A GENERAL ALL-OUT WAR AND IN LOW-INTENSITY CONFLICTS (LIC). IN BOTH CASES, THE SOFs WILL REQUIRE UNIQUE EQUIPMENT AND POSSIBLY UNIQUE TRANSPORT VEHICLES IN ORDER TO ASSURE MISSION SUCCESS. ANY FUTURE SOF TRANSPORT VEHICLE (WHETHER CTOL, STOL, VTOL, OR HELICOPTER), MUST PENETRATE INCREASINGLY LETHAL AIR DEFENSE NETWORKS. IF CURRENT TRENDS CONTINUE, BY THE YEAR 2005 MOST THIRD WORLD COUNTRIES WILL HAVE FIELDED SOPHISTICATED MEDIUM- TO LONG-RANGE SURFACE-TO-AIR DEFENSIVE SYSTEMS. THESE SYSTEMS WILL BE ADJUNCTS TO CURRENT SHORT RANGE MISSILE AND SMALL ARMS THREATS. THIS ACTIVITY PROPOSES TO EXAMINE THE REQUIREMENTS FOR A SOF SUPPORT AIRCRAFT IN THE 2005 TIMEFRAME. TOYON WILL DEVELOP A METHODOLOGY FOR EVALUATING DIFFERENT SOF AIRCRAFT DESIGN CONCEPTS WHICH WILL INCLUDE A REVIEW OF THE PROJECTED THREAT, SOF SUPPORT REQUIREMENTS, RANGE/PAYLOAD AND CARGO-SIZE REQUIREMENTS, A SURVIVABILITY ANALYSIS, AND A TRADEOFF STUDY BETWEEN OBSERVABLES AND PENETRATION AIDS. THE GOAL OF THE METHODOLOGY IS TO DEFINE THE MOST COST-EFFECTIVE SOF SUPPORT AIRCRAFT. THE PHASE I EFFORT WILL INCLUDE AN EVALUATION OF A SINGLE SOF DESIGN CONCEPT.

TOYON RESEARCH CORP
75 AERO CAMINO - STE A
GOLETA, CA 93117
CONTRACT NUMBER:
HAROLD I JACOBSON
TITLE:
AERONAUTICAL/SPACE OPERATIONAL INTERFACE REQUIREMENT
TOPIC# 150 OFFICE: AFWAL/ASD IDENT#: 27011

A METHODOLOGY IS REQUIRED FOR ASSESSING THE UTILITY OF SPACE ASSETS TO SUPPORT AIRCRAFT AND CRUISE MISSILES WHEN PERFORMING STRATEGIC AND TACTICAL MISSIONS. PHASE I OF THIS SBIR PROGRAM WILL SURVEY ALL PERTINENT METHODOLOGIES AND WILL DEVELOP CRITERIAL FOR SELECTING THE ONE MOST CAPABLE FOR THIS PURPOSE. THE ACTUAL USE OF THE METHODOLOGY WILL BE IN PHASE II. THE INNOVATIVE ASPECT OF THIS EFFORT IS THE APPROACH OF STARTING WITH A GIVEN METHODOLOGY, THE STRAT DEFENDER-2 MODEL OF THE AIR FORCE CENTER FOR STUDIES AND ANALYSIS, HQ USAF, WHICH ALREADY CONTAINS AN INTERFACE BETWEEN SPACE AND AERONAUTICAL

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OPERATIONS, AND OF DETERMINING WHETHER ANY OTHER MODEL IS MORE CAPABLE THAN IT TO ASSESS THE VALUE OF SPACE ASSETS IN OPERATIONAL CONTEXTS.

TRICOR SYSTEMS INC
400 RIVER RIDGE DR
ELGIN, IL 60123
CONTRACT NUMBER:
JOHN J JEREB
TITLE:
IMPROVED WHITE LIGHT SOURCE FOR AIRCRAFT APPLICATION
TOPIC# 82 OFFICE: AFWAL/ASD IDENT#: 26903

THERE ARE A VARIETY OF ADVANCED DEVELOPMENT PROGRAMS WHICH REQUIRE THE USE OF A VERY EFFICIENT, SMALL, RUGGED WHITE LIGHT SOURCE FOR AIRCRAFT APPLICATIONS. TODATE, SYSTEMS HAVE BEEN DESIGNED TO USE EXISTING COMMERCIALLY AVAILABLE SOURCES INSTEAD OF PERFORMING THE SYSTEM-SOURCE DESIGN INTEGRATION NEEDED TO OPTIMIZE SYSTEM PERFORMANCE. THE PROPOSAL CONCENTRATES ON THE SYSTEM IMPACT OF EACH OF THE SOURCE PARAMETERS. IT IDENTIFIES THE PROBLEMS THAT HAVE BEEN ENCOUNTERED IN THE FIELD, OFFERS POSSIBLE SOLUTIONS, AND OUTLINES A SEVEN TASK PROGRAM. THE SEVEN TASKS CALL FOR A MARKET SURVEY, SOURCE TESTING, SYSTEM IMPACT ANALYSIS, CONCEPT EVALUATION, MANUFACTURER INTERFACE, SOURCE SPECIFICATION GENERATION AND A FINAL REPORT WITH RECOMMENDATIONS.

TRICOR SYSTEMS INC
400 RIVER RIDGE DR
ELGIN, IL 60123
CONTRACT NUMBER:
GARY L CONRAD
TITLE:
AIRCRAFT SIGNATURE SITUATIONAL AWARENESS
TOPIC# 86 OFFICE: AFWAL/ASD IDENT#: 26910

SIGNATURE SITUATIONAL AWARENESS, (SSA), FOR AN AIRCRAFT IS A NATURAL EXTENSION OF RECENTLY PROVEN TECHNIQUES. THIS PROPOSAL PROVIDES A

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BRIEF DISCUSSION OF THE PHYSICS INVOLVED IN USING THE ENVIRONMENT TO AN ADVANTAGE. ALSO PROVIDED IS ANALYTICAL DATA TO CORROBORATE THE CONCEPT. THE PROPOSAL DISCUSSES HARDWARE AND ALGORITHMS ALREADY IN EXISTENCE THAT CAN BE USED AS BUILDING BLOCKS, AND DETAILS A SYSTEMATIC WORK PLAN FOR SOLVING THE UNIQUE PROBLEMS ASSOCIATED WITH SSA. THIS PROPOSAL EMPHASIZES THE AIR-TO-AIR ENCOUNTER, AS THE MOST BENEFIT CAN BE DERIVED IN THAT SCENARIO. AN AIR-TO-GROUND ENCOUNTER REPRESENTS A SIMPLER SUBSET OF THE PROBLEM DUE TO THE LACK OF STRINGENT TIME CONSTRAINTS. TRICOR'S OPTICAL ENCOUNTER, (OPEC) DYNAMIC DETECTION MODEL, AND IT'S SIGNATURE ANALYSIS DEVELOPMENT AND SIMULATION SYSTEM, (SADSS) ARE INTIMATELY INVOLVED IN BOTH THE DESIGN AND EVALUATION OF SOLUTIONS TO THE PROBLEM. SADSS IS IDENTICAL IN FUNCTION TO THE AFWAL OBSERVABLES REDUCTION BY IMAGE PROCESSING SYSTEM, (ORIPS), WITH ALL INFORMATION DEVELOPED DIRECTLY USABLE ON EITHER SYSTEM. SADSS USE AS A PROBLEM VISUALIZATION AND QUALITATIVE ANALYSIS TOOL SUPPLEMENTED BY OPEC FOR QUANTITATIVE ANALYSIS, IS DESCRIBED IN THE PROPOSAL.

TTL TECHNIQUES
65 LINEKILN PIKE
GLENSIDE, PA 19038
CONTRACT NUMBER:
ROBERT J DeMARIA
TITLE:
FINE LINE INPUT/OUTPUT INTERCONNECTION ON GaAs DEVICES WITH TAB BONDING
TOPIC# 47 OFFICE: RADC/XPX IDENT#: 28573

TWO TAB "BUMPING" AND TWO TAB TAPE FABRICATION PROCESSES WILL BE DEVELOPED AND EVALUATED. ALSO INCLUDED IN THE EVALUATION WILL BE A NEW TAB LEAD DESIGN. THESE EMERGING TECHNOLOGIES ALONG WITH TECHNOLOGIES GROWING OUT OF PREVIOUS MICROELECTRONICS PACKAGING S.B.I.R. RESEARCH PROGRAMS WILL BE INTEGRATED AND EVALUATED PER MIL SPEC 883 TESTING. IF SUCCESSFUL, THIS PROJECT WILL ALSO PROVIDE HIGHLY DESIRABLE PACKAGING WHICH MAY BE IMPLEMENTED FOR HIGH SPEC DIGITAL SIGNAL PROCESSING AS WELL AS ONE WITH EXCELLENT THERMAL MANAGEMENT PROPERTIES. CONVENTIONAL MICROELECTRONICS AND PRINTED CIRCUIT BOARD TECHNOLOGY IS IMPLEMENTED HELPING TO KEEP THE PROPOSED PROCESS COST EFFECTIVE.

SUBMITTED BY

TXS INC
8961 TESORO DR - STE 544
SAN ANTONIO, TX 78217
CONTRACT NUMBER:
DR MICHAEL R THOMAS
TITLE:
THE APPLICATION OF TRANSFORM IMAGING TO SPEAKER INDEPENDENT CONTINUOUS SPEECH RECOGNITION
TOPIC# 64 OFFICE: AFHRL/HSD IDENT#: 26876

SPEAKER INDEPENDENT, CONTINUOUS SPEECH RECOGNITION BY COMPUTERS HAS BEEN PURSUED FOR OVER THIRTY YEARS. CURRENTLY, THE MOST SUCCESSFUL VOICE RECOGNITION SYSTEMS RELY ALMOST EXCLUSIVELY ON HARDWARE SOLUTIONS AND DESPITE EXTREMELY POWERFUL MACHINES AND ELABORATE AND THOROUGH PROGRAMMING, THEY REQUIRE CONSIDERABLE TRAINING AND CUSTOMIZATION ON THE PART OF USERS. THIS PROJECT PROVIDES DESIGN DOCUMENTS FOR AND A PROOF-OF-CONCEPT SOFTWARE SYSTEM THAT RECOGNIZES SPEAKER INDEPENDENT AND CONTINUOUS SPEECH. THE AUTHORS TAKE A DIFFERENT APPROACH TO THE PROBLEM BY USING TWO NEW TECHNIQUES. ONE IS A PROPRIETARY WAY TO CAPTURE AND ANALYZE ACOUSTIC AND SEMATIC DATA THAT TARGETS THE INFORMATION HUMAN BEINGS USE IN SPEECH RECOGNITION. THE OTHER IS A PROPRIETY PATTERN MATCHING TECHNOLOGY CALLED "TRANSFORM IMAGING" THAT RAPIDLY MATCHES PATTERN ON THE BASIS OF THEIR SIMILARITY TO CHARACTERIZING EXAMPLES.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER:
RICHARD B KAPLAN
TITLE:
HIGH STRAIN RATE DEFORMATION MECHANISMS IN CVD TUNGSTEN AND RHENIUM
TOPIC# 1 OFFICE: AD/PMR IDENT#: 23295

CHEMICALLY VAPOR DEPOSITED (CVD) TUNGSTEN IS POTENTIALLY A COST-

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EFFECTIVE MATERIAL FOR HIGH STRAIN RATE APPLICATIONS. THE EFFECTS OF PROCESS VARIABLES ON THE MECHANICAL PROPERTIES OF CURRENTLY AVAILABLE CVD TUNGSTEN ARE NOT UNDERSTOOD SUFFICIENTLY FOR ITS PROPERTIES TO BE OPTIMIZED FOR A VARIETY OF HIGH STRAIN RATE APPLICATIONS. IN THIS PHASE I PROGRAM, ULTRAMET PROPOSES TO INVESTIGATE THE EFFECTS OF PROCESS VARIABLES ON THE CHEMISTRY, MICROSTRUCTURE, AND HIGH STRAIN RATE MECHANICAL PROPERTIES OF CVD TUNGSTEN AND RHENIUM. A UNIQUE DOUBLE-PURIFICATION METHOD WILL BE USED TO CONTROL ANION IMPURITIES IN TUNGSTEN TO LEVELS PREVIOUSLY UNATTAINABLE. CVD RHENIUM IS OF INTEREST BECAUSE IT EXHIBITS DUCTILITY AT ROOM TEMPERATURE AND AT LOW STRAIN RATES, IN CONTRAST TO RECENT EXPERIENCE WITH TUNGSTEN. IT WILL THUS BE AN EXCELLENT BASELINE COMPARISON MATERIAL.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER:
HUGH O PIERSON
TITLE:
ULTRASTRUCTURE FOR COLD CATHODE EMITTERS
TOPIC# 46 OFFICE: RADC/XPX IDENT#: 28572

IN THIS PHASE I PROGRAM, ULTRAMET PROPOSES TO DEMONSTRATE THE FEASIBILITY OF DEPOSITING THE BORON-BORON NITRIDE COUPLE, PRODUCED BY MICROWAVE PLASMA-ENHANCED CHEMICAL VAPOR DEPOSITION (CVD). IT WILL DEMONSTRATE THAT AN ULTRASTRUCTURE COMPOSED OF ALTERNATING NANOMETER-THICK LAYERS OF BORON, A GOOD ELECTRICAL CONDUCTOR AT HIGH TEMPERATURES, AND BORON NITRIDE, A GOOD INSULATOR AND DIELECTRIC AT ANY TEMPERATURE, CAN BE OBTAINED. THESE ULTRASTRUCTURES SHOULD BE SUITABLE FOR THE DESIGN OF ADVANCED COLD CATHODES BY PROVIDING GEOMETRIC ENHANCEMENT OF THE NEAR SURFACE ELECTRIC FIELDS.

UNIVERSAL ENERGY SYSTEMS INC
4401 DAYTON-XENIA RD
DAYTON, OH 45432
CONTRACT NUMBER:
RABI S BHATTACHARYA
TITLE:
THIN FILM JOSEPHSON JUNCTION BASED ON HIGH T(c) SUPERCONDUCTOR
TOPIC# 76 OFFICE: AFWAL/ASD IDENT#: 26894

SUBMITTED BY

APPLICATIONS OF THIN FILM HIGH T(c) SUPERCONDUCTORS ARE ANTICIPATED IN VARIOUS ELECTRONIC DEVICES SUCH AS IN SENSORS, DETECTORS, MILLIMETER WAVE COMPONENTS AND AS COATINGS ON POWER TRANSMISSION LINES. SEVERAL GROUPS HAVE SUCCESSFULLY DEPOSITED THIN FILMS ON SINGLE CRYSTAL SrTiO(3) AND MgO SUBSTRATES USING CONVENTIONAL TECHNIQUES SUCH AS SPUTTERING AND E-BEAM EVAPORATION. A SIGNIFICIANT STEP TOWARD REALIZING THE POTENTIAL APPLICATION OF THIN FILM HIGH T(c) SUPERCONDUCTOR IN ELECTRONIC DEVICES WILL BE THE FABRICATION OF A JOSEPHSON JUNCTION. THIS PROPOSAL ADDRESSES THE FEASIBILITY OF FABRICATION OF A VERTICAL JOSEPHSON JUNCTION DEVICE USING THIN TANTALUM OXIDE LAYER AS THE TUNNELING DIELECTRIC. THIN FILM SANDWICH STRUCTURE WILL BE DEPOSITED BY MAGNETRON SPUTTER DEPOSITION. THE SANDWICH STRUCTURE WILL BE CHARACTERIZED FOR ITS PHYSICAL AND ELECTRICAL PROPERTIES.

UNIVERSAL ENERGY SYSTEMS INC
4401 DAYTON-XENIA RD
DAYTON, OH 45432
CONTRACT NUMBER:
CARBEL RAFFOUL
TITLE:
SYSTEM LEVEL TECHNOLOGY ASSESSMENT METHODOLOGY FOR SHORT TAKEOFF AND VERTICAL LANDING (STOVL) TYPE AIRCRAFT
TOPIC# 92 OFFICE: AFWAL/ASD IDENT#: 26917

THE OBJECTIVE OF THIS PHASE I EFFORT IS TO ASCERTAIN THE FEASIBILITY OF USING A SPECIFIC COMPUTER SIMULATION METHODOLOGY TO DETERMINE THE EFFECTS OF ADVANCED TECHNOLOGIES ON AIRCRAFT PERFORMANCE AND MISSION ACCOMPLISHMENT. CERTAIN ADVANCED TECHNOLOGIES ADD WEIGHT AND/OR VOLUME TO AIRCRAFT AND MAY DEGRADE AIRCRAFT PERFORMANCE DURING CERTAIN PORTIONS OF THE MISSION WHILE IMPROVING THE PERFORMANCE DURING OTHER PARTS OF THE MISSION. AIRCRAFT IN THE ACTIVE INVENTORY ARE OFTEN MODIFIED IN ORDER TO BETTER MEET MISSION NEEDS AND TO IMPROVE THE PROBABILITY OF ACCOMPLISHING SPECIFIC MISSIONS. THIS STUDY WILL DEMONSTRATE A METHOD OF COMPROMISING IN ORDER TO MAXIMIZE THE PROBABILITY OF MEETING MISSION OBJECTIVES.

UNIVERSITY TECHNOLOGISTS INC
1215 WESTHEIMER DR
NORMAN, OK 73069
CONTRACT NUMBER:
DR C N SLIEPCEVICH
TITLE:
DEVELOPMENT OF AN EXPERIMENTALLY VERIFIED PROCESS FLOW DIAGRAM FOR THE PRODUCTION OF LIQUID NITROGEN TETROXIDE
TOPIC# 159 OFFICE: AFSD IDENT#: 27091

SUBMITTED BY

THE PLANNED INCREASED USAGE BY THE AIR FORCE OF BIPROPELLANT SYSTEMS SUCH AS NITROGEN TETROXIDE AND MONOMETHYL HYDRAZINE FOR SPACECRAFTS REQUIRES THAT A PROCESS PRODUCING ESSENTIALLY PURE LIQUID NITROGEN TETROXIDE BE DEVELOPED. LIQUID NITROGEN TETROXIDE CURRENTLY PRODUCED BY AVAILABLE TECHNIQUES CONTAINS IMPURITIES WHICH CAN CLOG FILTERS AND VALVES ON BIPROPELLANT SYSTEMS. LABORATORY PREPARATION OF LIQUID NITROGEN TETROXIDE VIA THE CATALYTIC COMBUSTION OF AMMONIA INDICATES THAT AN ESSENTIALLY PURE MATERIAL CAN BE MADE. THE PRIMARY OBJECTIVE OF THE PROGRAM IS THE VALIDATION OF THE BENCH SCALE PRODUCTION OF NITROGEN TETROXIDE VIA THE CATALYTIC COMBUSTION OF AMMONIA. THE PROPOSED STUDY FOR PHASE I OF THE PROGRAM INVOLVES THE DEVELOPMENT OF A PROCESS FLOW DIAGRAM WITH OPERATING CONDITIONS (PRESSURES, TEMPERATURES AND FLOW RATES) WITH SUBSEQUENT EXPERIMENTAL VERIFICATION. THE ANTICIPATED PROCESS INVOLVES A MODIFICATION OF THE PROCESS COMMERCIALLY USED IN THE PRODUCTION OF NITRIC ACID. WITH THE DEVELOPMENT OF AN EXPERIMENTALLY-VALIDATED PROCESS FLOW DIAGRAM, THE RESEARCH AND DEVELOPMENT EFFORT REQUIRED TO DESIGN, CONSTRUCT AND OPERATE A PILOT PLANT SYSTEM TO FINALIZE THE PROCESS PARAMETERS OF A FULL SCALE PLANT WILL BE REDUCED.

VIA-SAT INC
6120 PASEO DEL NORTE - J2
CARLSBAD, CA 92009
CONTRACT NUMBER:
MARK DANKBERG
TITLE:
ADVANCED TECHNOLOGY APPLICATION TO MANPACK UHF SATELLITE TERMINAL
TOPIC# 31 OFFICE: ESD/XRB IDENT#: 28551

THIS PROPOSAL DESCRIBES A STUDY TO DETERMINE SPECIFICATIONS FOR AN ADVANCED UHF MANPACK SATCOM TERMINAL THAT OFFERS SUBSTANTIAL IMPROVEMENTS IN PHYSICAL SIZE, WEIGHT, AND BATTERY LIFE OVER CURRENT GENERATION MANPACKS. THE SPECIFIED MANPACK TERMINALS WILL ALSO PROVIDE IMPORTANT INCREASES IN FUCTIONALITY OVER EXISTING MANPACKS, ESPECIALLY IN TERMS OF NETWORK CONTROL AND INTEROPERABILITY. MAJOR CONSIDERATIONS DURING THE STUDY INCLUDE MISSION MODELING, POWER REQUIREMENTS, COMSEC INTEROPERABILITY, AND CONTROL. THE PROPOSED WORK BEGINS WITH AN ANALYSIS THAT DETERMINES FUNCTIONAL ASPECTS OF MANPACK

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RADIOS, AND ASSOCIATED PERIPHERALS, THAT OFFER THE GREATEST POTENTIAL FOR SIZE, WEIGHT, AND POWER SAVINGS DUE TO APPLICATION OF ADVANCED TECHNOLOGY AND/OR FUNCTIONAL INTEGRATION. WE ALSO WILL PERFORM TERMINAL ARCHITECTURE AND DESIGN WORK LEADING TO A TAILORED B1-TYPE SPECIFICATION FOR A NEXT GENERATION MANPACK. THE B1 SPECIFICATION WILL BE SUITABLE TO PROCURE A WORKING PROTOTYPE ADVANCED MANPACK TERMINAL IN A SUBSEQUENT FIRM FIXED PRICE PHASE II SBIR CONTRACT. THE MAJOR DELIVERABLE UNDER THE PROPOSED CONTRACT IS A FINAL REPORT COMPILING THE FUNCTIONAL ANALYSIS, ARCHITECTURE, DESIGN, AND SPECIFICATION RESULTS AND TRADE STUDIES.

VISTA RESEARCH CORP
3826 SNEAD DR
SIERRA VISTA, AZ 85635
CONTRACT NUMBER:
J G CALDWELL
TITLE:
TACTICAL THEATER AIR WARFARE METHODOLOGIES
TOPIC# 151 OFFICE: AFWAL/ASD IDENT#: 27012

THIS PROPOSAL PROPOSES TO DEVELOP AN AI-BASED METHODOLOGY FOR GENERATING TACTICAL AND OPERATIONAL-LEVEL SCENARIOS, STRATEGIES, PLANS, AND TACTICS. THE APPROACH INCORPORATES CONCEPTS FROM ARTIFICIAL INTELLIGENCE (AI), GAME THEORY, AND SIMULATION TECHNOLOGY. THE PURPOSE OF THE METHODOLOGY IS TO HAVE AN AUTOMATED PROCEDURE AVAILABLE FOR GENERATING SAMPLES OF SCENARIOS AND PLANS, WHICH MAY BE UTILIZED AS A BASIS FOR CONDUCTING PLANNING AND EVALUATION STUDIES. THERE ARE TWO PRINCIPAL BENEFITS THAT WOULD RESULT FROM AN AUTOMATIC SCENARIO-GENERATION CAPABILITY. FIRST, THE AVAILABILITY OF SAMPLES OF SCENARIOS ENABLES THE SCOPE OF INFERENCE OF AN ANALYSIS TO BE BROADER-BASED THAN IF THE ANALYSIS IS BASED ON A SINGLE SCENARIO, STRATEGY, PLAN, OR TACTIC. THE SECOND PRINCIPAL BENEFIT THAT WOULD RESULT FROM AN AUTOMATIC SCENARIO-GENERATION CAPABILITY IS THAT A POWERFUL METHODOLOGY WOULD BE AVAILABLE FOR EVALUATION OF COMMAND AND CONTROL, COMMUNICATIONS, ELECTRONIC WARFARE, AND INTELLIGENCE (CCCEWI) SYSTEMS.

VISTA RESEARCH INC
PO BOX 998
MOUNTAIN VIEW, CA 94042
CONTRACT NUMBER:
JEFF NEILSON
TITLE:
CAD MICROWVE COUPLING CODE
TOPIC# 183 OFFICE: AFWL IDENT#: 27136

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THIS SOFTWARE DEVELOPMENT PROGRAM WILL RESULT IN A MICROWAVE COUPLING CODE PACKAGE CAPABLE OF INTERFACING WITH OUTPUT FROM VARIED CAD SYSTEMS. THIS PACKAGE WILL GREATLY EASE GENERATION OF STRUCTURAL AND ELECTRICAL DATA FOR MICROWAVE COUPLING CODES.

WESTMONT INC
PO BOX 3145
ALLIANCE, OH 44601
CONTRACT NUMBER:
MICHAEL J ZAWASKI
TITLE:
INVESTIGATION OF AN INNOVATIVE SELF-COMPENSATING SEAL
TOPIC# 130 OFFICE: AFWAL/ASD IDENT#: 26973

AN INVESTIGATION OF AN INNOVATIVE SELF-COMPENSATING SEAL UTILIZING AN UNIQUE GEOMETRY. THE STUDY WILL DEVELOP A MATHEMATICAL MODEL USING THE FINITE ELEMENT METHOD AND CLASSICAL PHYSICS METHODS WHERE APPROPRIATE. THESE METHODS WILL BE USED TO ANALYZE AND VERIFY THE SEAL CONCEPTS. THE INVESTIGATION WILL INCLUDE MATERIAL AND WEAR STUDIES TO FIND APPROPRIATE MATERIALS FOR THE SEVERE ENVIRONMENT OF AN ADVANCED TECHNOLOGY TURBINE ENGINE. THE ULTIMATE GOAL OF THE STUDY IS THE DESIGN OF A PROTOTYPE SEAL.

WIZDOM SYSTEMS INC
1260 IROQUOIS
NAPERVILLE, IL 60540
CONTRACT NUMBER:
DENNIS WISNOSKY
TITLE:
WIZARD: AN INTELLIGENT ULCE MECHANICAL DESIGN AID
TOPIC# 119 OFFICE: AFWAL/ASD IDENT#: 26957

WIZARD IS A PROPOSED INTELLIGENT UNIFIED LIFE CYCLE ENGINEERING (ULCE) MECHANICAL DESIGN AID. WIZARD AUTONOMOUSLY CREATES OPTIMAL DESIGNS OF MECHANICAL PARTS. WIZARD WILL INTERFACE TO A FEATURE BASED MODELING SYSTEM TO GET DESIGN VARIABLES. WIZARD WILL USE A

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UNIFORM KNOWLEDGE REPRESENTATION SCHEMA TO REPRESENT PARTS AND THEIR PROPERTIES. SUCH A SCHEMA PERMITS DIFFERENT APPLICATIONS AND EXPERT SYSTEMS TO COMMUNICATE CLEARLY ABOUT PARTS AND MATERIALS USED IN THE DESIGN. WIZARD WILL USE BOTH ALGORITHMIC OPTIMIZATION ROUTINES AND ARTIFICIAL INTELLIGENCE HEURISTICS TO OPTIMIZE THE DESIGN. WIZARD WILL INTERACT WITH MECHANICAL DESIGN ENGINEERS TO ACQUIRE AND CODIFY MECHANICAL DESIGN EXPERTISE. THE DESIGN PROCESS USING WIZARD WOULD WORK AS FOLLOWS. THE HUMAN DESIGNER WILL SKETCH OUT DESIGN FEATURES AND REQUIREMENTS USING A FEATURE BASED MODELING SYSTEM. WIZARD WILL GLEAN KEY DESIGN VARIABLES AND REQUIREMENTS FROM THE SYSTEM'S DESIGN FILES. WIZARD WILL THEN OPTIMIZE THE DESIGN USING TWO COMPLEMENTARY APPROACHES. WHERE POSSIBLE, WIZARD WILL USE OPERATIONS RESEARCH OPTIMIZATION ALGORITHMS, SUCH AS THOSE USED IN NON-LINEAR PROGRAMMIG, TO OPTIMIZE THE DESIGN OR A PORTION OF IT. WHERE ALGORITHMIC OPTIMIZATION IS NOT FEASIBLE, WIZARD WILL USE ITS KNOWLEDGE BASE TO HEURISTICALLY OPTIMIZE THE DESIGN. PHASE I WILL DEFINE THE DESIGN VARIABLES, CONSTRAINT EQUATION TYPES, AND OBJECTIVE FUNCTIONS WHICH PERTAIN TO TYPICAL AIR FORCE MECHANICAL DESIGNS. PHASE I WILL IDENTIFY THE LIFE CYCLE FACTORS WHICH MUST BE CONSIDERED IN CHOOSING AN OPTIMAL DESIGN. PHASE I WILL DESCRIBE THE INTERFACES BETWEEN THE FEATURE BASED MODELING SYSTEM, THE OPTIMIZATION ALGORITHMS, AND THE HEURISTIC KNOWLEDGE BASE. PHASE I WILL SHOW A PROTOTYPE PROOF OF CONCEPT DEMONSTRATION.

XYNET CORP
265 BONHAM RD
CINCINNATI, OH 45215
CONTRACT NUMBER:
RICHARD P JOHNSTON
TITLE:
CLOSED CYCLE DIESEL POWER SYSTEM EVALUATION USING AN ADVANCED VARIABLE CYCLE DIESEL ENGINE
TOPIC# 208 OFFICE: BMO/MYSC IDENT#: 28621

THE CONCEPTUAL DESIGN OF A CLOSED CYCLE DIESEL POWER SYSTEM WILL BE DEVELOPED THAT UTILIZES AN ADVANCED VARIABLE CYCLE DIESEL ENGINE CONCEPT. SYSTEMS COMPONENTS, THEIR REQUIRED PERFORMANCE AND THE CONTROL METHOD(S) NEEDED FOR SUCCESSFUL SYSTEM OPERATION WILL BE DETERMINED. TECHNOLOGY READINESS OF THE VARIOUS SUBSYSTEMS WILL

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BE ASSESSED.

ZYBRON CORP
6012 N DIXIE DR
DAYTON, OH 45414
CONTRACT NUMBER:
YOU-WEN ZHANG
TITLE:
HIGH DATA RATE OPTICAL HEAD
TOPIC# 51 OFFICE: RADC/XPX IDENT#: 28578

THIS PROPOSAL SHOWS A METHOD FOR SIGNIFICANTLY ENHANCING THE SPEED AND EFFICIENCY OF THE OPTICAL DISK HEAD. (1) WEIGHT COULD BE REDUCED WITH THE PROPOSED DESIGN FOR HOLOGRAPHIC OPTIC ELEMENTS (H.O.E.), WHICH HAVE FEWER ELEMENTS AND COULD BE MADE WITH LIGHTER AND LESS EXPENSIVE PLASTIC MATERIALS. (2) THE PROPOSED H.O.E. CONFIGURATION ALLOWS REDUCTION OF THE F-NUMBER WITHOUT IMAGE QUALITY DEGRADATION; AND WITH A SMALLER F-NUMBER, COLLECTION OF THE LASER IS MORE EFFICIENT. (3) THE PROPOSAL INCLUDES THE DEVELOPMENT OF A COMPUTER PROGRAM FOR THE AUTOMATIC DESIGN OF H.O.E. CONFIGURATION. THE MOST INNOVATIVE PART OF THIS PROPOSAL IS THE COMPENSATION FOR LASER DIODE WAVELENGTH SHIFT, WHICH HAS STYMIED EFFORTS TO USE HOLOGRAMS IN THIS APPLICATION. THE SYSTEM CAN ACHIEVE AN IMAGE SPOT SIZE OF ONE MICRON (1).

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